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COMPRESSED AIR SYSTEM ON THE UNITED STATES MONITOR TERROR.

The use of compressed air as a motive power on board a war ship presents several advantages over steam or hydraulic power, which render it a powerful competitor. As compared with steam, it is less dangerous, especially during an action, when a broken steam pipe might prove terribly fatal, and it enables certain parts of the ship to be kept at an even temperature, which would otherwise be rendered uncomfortably hot by the presence of steam piping. Steam and hydraulic engines, moreover, require exhaust pipes discharging outside the hull of the ship; whereas the exhaust from the pneumatic cylinders may be turned into the ship or into the outside air, as may be most convenient. There are certain localities in a ship where the exhaust from a pneumatic engine would prove a valuable source of ventilation, as, for instance, in a turret crowded with men and machinery, or in the close confinement of a steering room situated below the protective deck. As compared with hydraulic power, the compressed air system is cleaner and more convenient, and free from the discomfort that arises from the leaking of hydraulic pipes and cylinders.

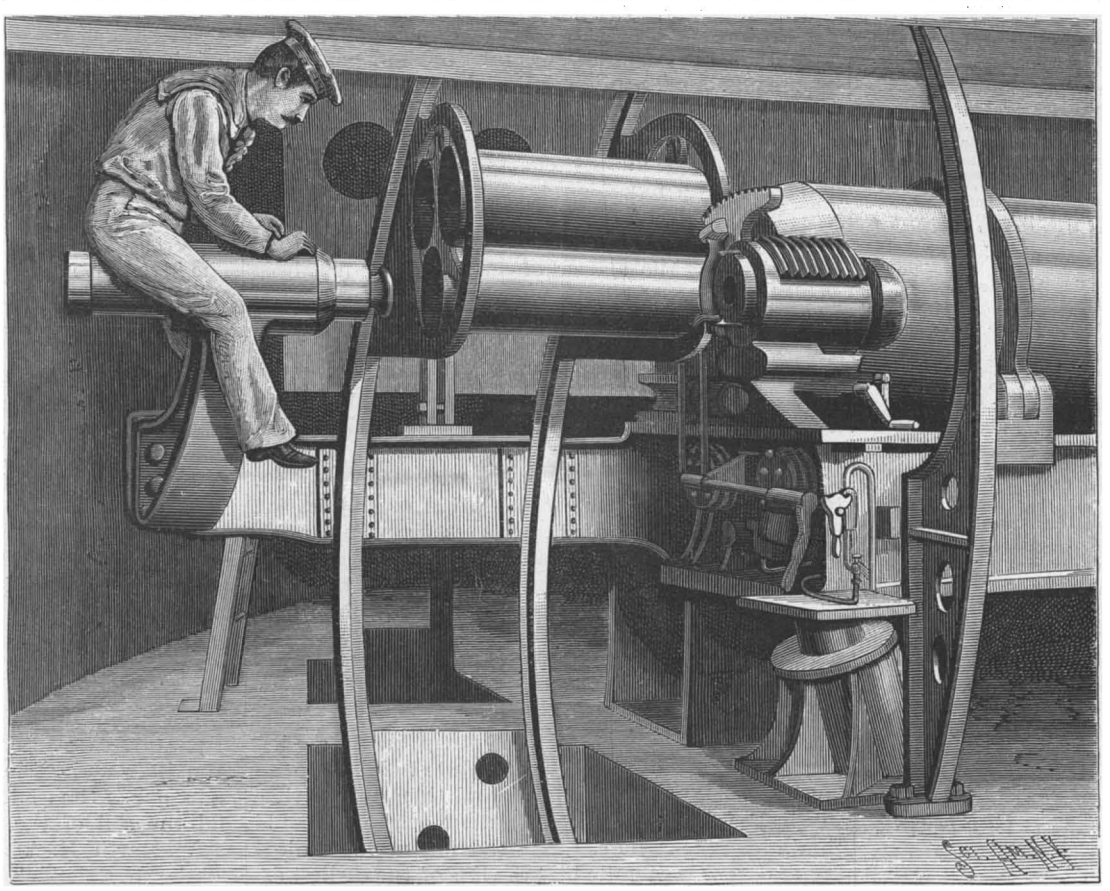
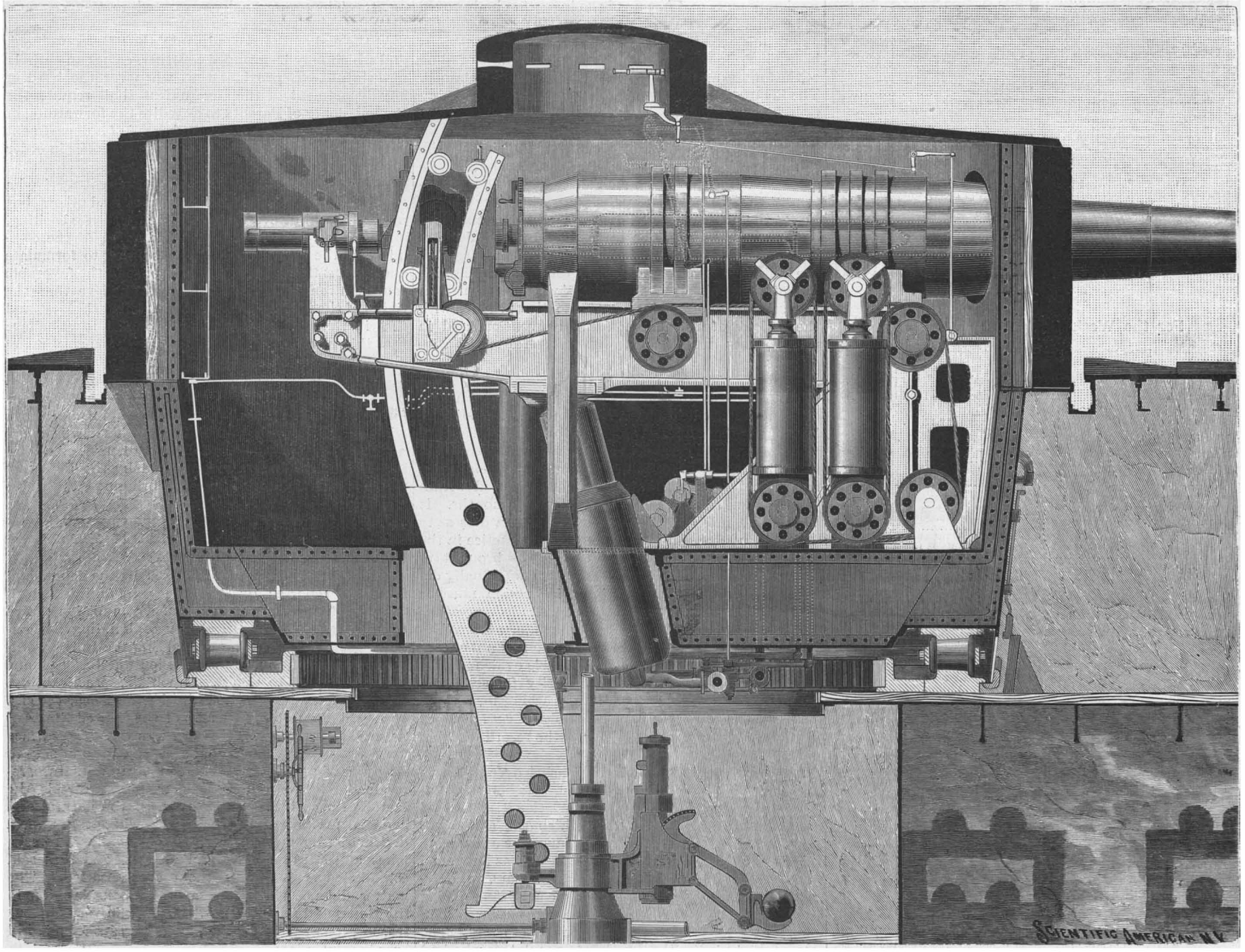


Fig. 2.—LOADING CAR IN POSITION BETWEEN THE TELESCOPIC RAMMER AND THE BREECH OF THE GUN.

It was about eight years ago that Secretary Whitney of the Navy Department authorized the Pneumatic Gun Carriage and Power Company, of Washington, to build a pneumatic system for steering the monitor Terror and operating her turrets. Owing to delays in the completion of the ship, the new system was not tried until late in 1896, when the whole of the elaborate plant was put to a thorough test at sea, and gave the greatest satisfaction to the naval experts. As the Terror was the first vessel in the world to be so equipped, there was considerable anxiety as to the success of the experiment; but now that the plant has demonstrated its ability to do all

(Continued on page 185.)



THE PNEUMATIC SYSTEM FOR MANIPULATING THE TEN INCH GUNS ON THE MONITOR TERROR—SECTIONAL VIEW OF ONE OF THE TURRETS.

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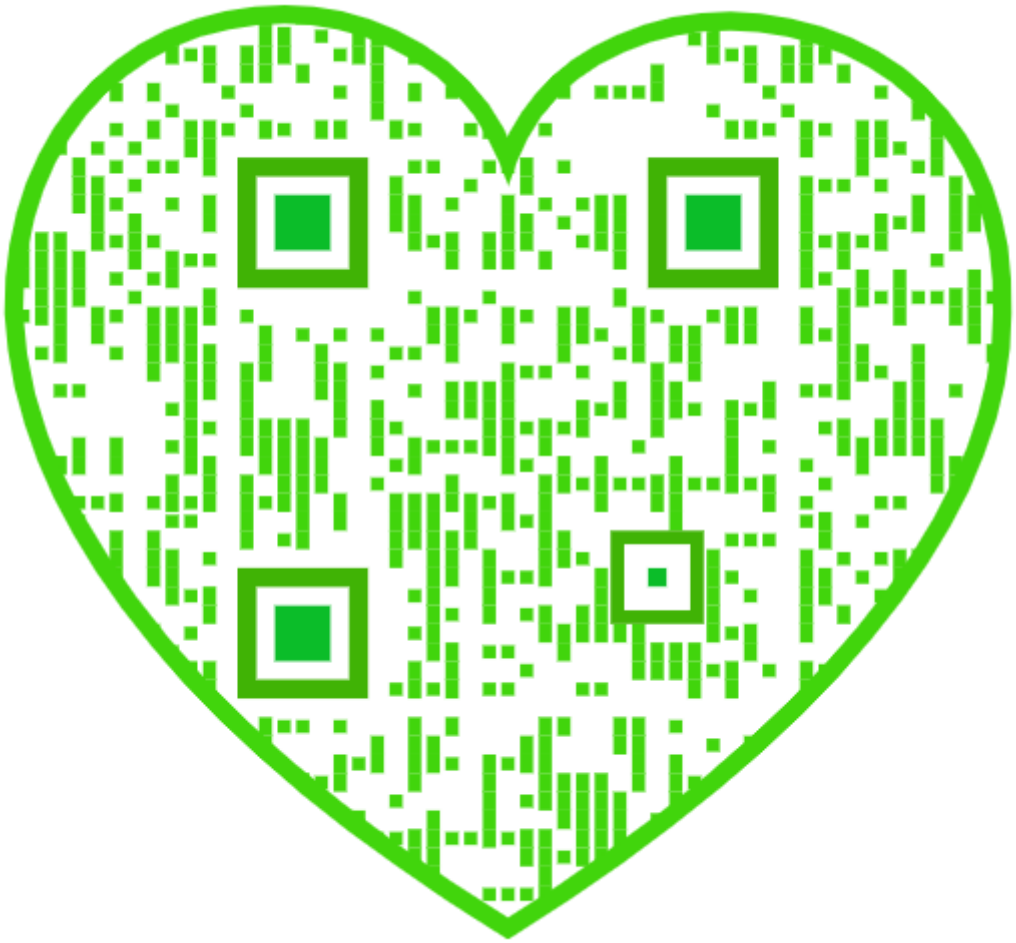

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NEW YORK, SATURDAY, MARCH 20, 1897.

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IMPORTANT AMENDMENTS TO THE UNITED STATES PATENT STATUTES.

A bill, H. R. 10,223, embodying important amendments to the Patent Statutes of the United States, has recently been enacted by Congress and became a law on the day of the inauguration of our new President. In the past we have, on several occasions, noticed the progress of these particular amendments, which are the most serious ones which have been proposed for many years—serious in the good sense of conservatism and proper origin, not serious in the sense of subverting the rights either of the public or of the inventor. We publish elsewhere in parallel column the portions of the old patent statutes affected by the amendments, together with the same portions as amended. An interesting feature in the case is that the bill passed the Senate on March 3, and was signed early on the morning of March 4, this being one of the last official acts of President Cleveland.

The first amendment enacts that publication or patenting of an invention here or abroad, more than two years prior to the application for a patent in the United States, will prevent the obtaining of a patent here. Thus, if the matter of an invention has been published or patented, perhaps by some one who was not the first and original inventor, the original inventor will be prevented from obtaining a patent unless he applies for it within two years of such publication. The doctrine of public use is to the effect that, if an invention has been in public use or on sale in this country over two years, no patent can be obtained, abandonment being virtually construed as heretofore. Now the same obtains for patenting or publication here and abroad. The inventor's resource against this restriction on his right to a patent is perfectly good and effective; namely, diligence. He has the very adequate period of two years given him within which to protect his rights in this country.

Another amendment, really subsidiary to the above, establishes a plea to the effect that such publication or patenting is a valid defense in a patent suit.

About the most radical of the amendments applies to section 4,887 of the patent statutes. Hitherto an inventor could patent abroad and then at any time within the life of his foreign patent or patents could obtain a patent here. But the life of his United States patent was limited by the life of the earliest expiring foreign patent. It sometimes happened that he would not apply here until some years after obtaining foreign patents and not until the invention had proved to be a success. This is all changed. After a foreign patent has been issued, the United States patent must be applied for within seven months of the date of filing of the foreign application, or no patent can be obtained. The life of the foreign patents of earlier date of expiration, however, has no longer any effect upon the term of the United States patent.

The theory of the old provision for limiting the life of a patent here by the term of a foreign patent to the same inventor has been much discussed. The limitation of the period, however, often worked great injustice to the patentee, and it is for his benefit that it is done away with. At the same time, by the adoption of the seven months' period, the inventor is urged to use diligence, and without such diligence forfeits his patent rights absolutely. The period of seven months was selected in order to harmonize the practice with the articles of the international convention, and in practice does not affect the interests of American inventors.

The old system of giving to an applicant for letters patent successive periods of two years each for action on pending applications afforded an opportunity of keeping a patent application alive for years. In several well-known cases this led to great abuses. Recently the Commissioner of Patents has, without any special legislation, endeavored to abbreviate the period within which amendments should be filed to six months. It was at first intended to so amend the statutes as to make them harmonize with this present practice in the Patent Office, but so much pressure was brought to bear by attorneys and inventors that it was finally decided to make the term within which action must be taken one year, and the bill was so amended.

A somewhat more technical amendment provides that a properly acknowledged assignment, grant or conveyance of a patent shall be prima facie evidence of its execution. This prevents the necessity for sending a commission to distant parts of the world or for arranging for such with local counsel simply to get statutory evidence of such transactions upon the record in a patent suit.

Another amendment fixes the period over which an accounting for damages may extend. Hitherto this has been a very variable quantity. Sometimes it was fixed by the laws of the State within which the action was brought. In the absence of such laws, the accounting might go back for many years. Thus it has happened that a patent had expired a number of years, yet damages were asked for infringements committed during the life of the patent. Most of the witnesses would, in such a case, be either dead or impossible to find. The patent might be in the hands of speculators who had bought it simply to use as a weapon to obtain damages as hard to disprove as to prove.

Again, accountings are too often used to frighten parties to the suit into a settlement. Such a settlement may barely pay the expenses of the accounting; the amount paid may be but a tithe of the damages allowed by the master, but the moral effect in inducing other alleged infringers to pay royalty is very great. Instances are too numerous where, on accountings, the most exorbitant claims were made and allowed. With a period extending through twenty or thirty years in the past, the counsel had a field for the exercise of much ingenuity in establishing damages. Now the period of an accounting covers only the six years prior to the filing of the bill of complaint or issuing of the writ in the suit or action in question. This seems an ample period. It is not policy for the law to encourage an inventor to let his rights lie in abeyance until some infringer, perhaps an innocent one, shall have accumulated enough obligation to make him a valuable object of attack. The new amendments here, as elsewhere, are in the direction of inspiring diligence.

A brief résumé of the amendments may be thus put: The inventor, if he finds that his invention has been published or patented, must apply for his patent within two years of the date of such publication or patenting. The foreign patentee must seek to protect his rights here within the seven months of filing his application in the country of origin. The applicant in the Patent Office has a year only allowed him, except by special allowance from the Commissioner, within which to take action on his application. The patentee can only establish damages for infringement within a definite period, whose extent was determined by the general sense of State statutes of limitation. A United States patent is good for the period fixed by its date. The expiration of a prior foreign patent does not limit as heretofore the life of the United States patent.

These amendments are the results of the work of the American Bar Association, and carry with them a weight of authoritative backing that is seldom found in parallel cases. They were formulated by a special committee under the chairmanship of Edmund Wetmore, one of the leaders of the American Patent Bar, and the roll of the committee included such names as Wilmarth H. Thurston, ex-Patent Commissioner Charles G. Mitchell, Paul Bakewell and many other leading patent lawyers. Extensive correspondence was had with solicitors and others concerned in the amendments. They were finally presented to Congress and have passed with but little change.

At the end of the amendments thus far considered, and which may be grouped together, comes an entirely new statute. It provides that whenever the head of any department of the government shall request the Commissioner of Patents to expedite the forwarding of an application for a patent, such head of a department must be represented before the Commissioner in order to prevent the improper issue of a patent.

The bill, when first presented to Congress, received a good deal of criticism from attorneys and others, but rarely has a bill ever received such a strong backing, and the fact that it was the production of the committee of the Bar Association appointed to formulate and present the bill brought it at once to the favorable consideration of Congress. Many believe that the rights of the inventor have been curtailed thereby, and that in that respect it works a wrong; but we believe that this is not the case, and that it will correct many abuses that have arisen in the past, and that it is for the interest of the community that due diligence should be used, not only in filing and prosecuting applications for patents, but in seeking damages for infringements when infringement has taken place. This new law does not go into operation until January 1, 1898. Another bill, H.R. 10,202, was also approved by the President which is intended to facilitate the bringing of infringement suits.

THE PROPOSED MAMMOTH RELIEF MAP OF THE UNITED STATES.

A resolution was recently passed by the Senate and favorably reported by the library committee, which provided for the appointment of a commission of five to investigate the practicability of building a mammoth ground map of the United States. In the wording of the resolution the commission was to "examine into and report to Congress upon the practicability, advisability and cost of establishing at or near the city of Washington a ground map of the United States of America, on a scale of one square yard of map surface for each square mile of actual area, said ground map to be as nearly as may be our country in miniature, reproducing in earth and other materials, on scale, the boundaries and the topography, all the natural and artificial features of the surface, showing geographical divisions, also mountains, hills and valleys, forests, lakes and streams, cities and villages, and that said commission is to serve without compensation." The matter did not meet with favorable consideration in the House and failed to pass. For certain very obvious reasons, it is not likely that in its present form it will ever become a law.

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The proposal to establish a national map at the capital city of the United States is certainly, on the face of it, not unattractive, and no doubt it commanded the ready support of the members of the Senate. It is safe to say, however, that the gentlemen who cast their complacent vote on this occasion had not the least conception of the financial burden which they were preparing to lay upon the tired shoulders of the taxpayer; for it now appears, according to a competent authority, that the proposed map, if carried out strictly on the lines of the resolution, would cost in round numbers some $500,000,000!

Of course the commission of five would not have gone far in its inquiry before it began to realize the gigantic nature of the undertaking; and if it had included an expert in relief map construction, it would have seen at the very outset that the scale proposed, namely, "one square yard of map surface for each square mile of actual area," was altogether out of the question. Indeed, the most cursory estimate of the size of the completed work shows the impossible dimensions which it would attain, and we think the august body that committed itself to the scheme will learn with unmixed astonishment that it would be a six or seven mile drive to get round the map if it were built.

The United States have an east and west measurement of 3,000 miles and they extend north and south about 1,900 miles. On the proposed scale of 3 feet to the mile the ground map would be over a mile and a half long and over a mile wide, and there would be 5,700,000 square yards of ground surface to be modeled. If the model were to be given the proper degree of curvature, it would rise to a height of 1,440 feet above the ground level, or to over two and a half times the height of the Washington monument! But supposing that the scheme as it presented itself to the mind of the Senate was more modestly outlined, and that the proposed map was to be built on the flat, the cost, judged by the current prices that are paid for such work, would more than absorb the whole annual revenue of the United States government. Models that have heretofore been made for the scientific bureaus of the government have cost, we are told, $10 to $50 a square foot, and generally the higher price. If the work could be done at the lowest rate, it would cost, as anyone may readily estimate for himself, over $500,000,000.

The passage of this peculiar resolution has brought to this office a characteristic contribution from Mr. Cosmos Mindeleff, of Washington, in which the utter impracticability of the scheme is set forth. The writer, who is entitled to speak with authority on a matter of this kind, makes this incident the occasion for a lengthy and interesting account of the art of relief map construction. The paper, which is illustrated by diagrams and a map, will be found in the current issue of the SUPPLEMENT.

The utter impracticability of the scheme is shown by a consideration of some of the details of the cost, as worked out by Mr. Mindeleff. As a material of construction, earth is out of the question, that is, if the model is not to be quickly worn away by the elements. Asphalt or cement is suggested; but the first costs over $2 a square yard, and cement more. If the asphalt surface could be laid for $1 per yard, this would require an appropriation of over $5,000,000 for surfacing the model. To build up the contours in wood, as would have to be done to secure permanent work, would require some 1,000,000,000 feet of lumber, and the total cost of the material of all kinds would be not less than $30,000,000. At 50 cents per square foot for modeling, instead of $50 (the price which has been sometimes paid), this item would cost $25,000,000, and taken altogether, the estimate for the completed map cannot be brought down below $75,000,000.

At the same time, if the scheme were properly modified, there is no doubt but an effective work could be produced. On a sale of 3 miles to 1 inch, the map would be less than 100 feet in diameter, and the whole of it could be placed under cover. The scale would allow the topographical details to be brought out with sufficient distinctness, and the cost would be about fifty thousand dollars—a by no means prohibitive figure.

JAPANESE PATENTS.

The interest that is being taken by American manufacturers in the extension of the rights of protection by letters patent in Japan to American citizens is shown by the great number of inquiries that have been received by the Department of State during the past two months for information concerning the new convention between the two countries. The Japanese patent laws were established some years ago, but the privileges of the patent system were only extended to natives. The Japanese, being a progressive and inventive people, eagerly sought after and introduced American inventions and devices which could not be protected by the foreign inventor. On January 13 of this year a treaty was drawn up providing for the reciprocal protection of patents, trade marks and designs. The exchange of ratifications took place at Tokio on February 8, and on March 9 President McKinley issued a proclamation promulgating the terms of the treaty. This is a great step forward for Japan in the march of civilization, and will serve to develop the country industrially and will doubtless serve to advance greatly our commercial relations with that country.

A commercial museum is being established at Osaka, and Americans should protect their wares by letters patent before sending them to Japan for exhibition.

AMENDMENTS TO THE PATENT STATUTES.

THE OLD STATUTES.	THE AMENDED STATUTES.
SEC. 4886. Any person who has invented or discovered any new and useful art, machine, manufacture or composition of matter, or any new and useful improvement thereof, not known or used by others in this country, and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, and not in public use or on sale for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceedings had, obtain a patent therefor.	SEC. 4886. Any person who has invented or discovered any new and useful art, machine, manufacture, or composition of matter, or any new and useful improvements thereof, not known or used by others in this country before his invention or discovery thereof, *and not patented or described in any printed publication in this or any foreign country, before his invention or discovery thereof, or more than two years prior to his application*, and not in public use or on sale in this country for more than two years prior to his application, unless the same is proved to have been abandoned, may, upon payment of the fees required by law, and other due proceeding had, obtain a patent therefor.
SEC. 4920. In any action for infringement the defendant may plead the general issue, and having given notice in writing to the plaintiff or his attorney, thirty days before, may prove, on trial, any one or more of the special matters: . . . . . . Third. That it had been patented or described in some printed publication prior to his supposed invention or discovery thereof; or,	SEC. 4920. In any action for infringement the defendant may plead the general issue, and having given notice in writing to the plaintiff or his attorney thirty days before, may prove on trial any one or more of the following special matters: . . . . . . *Third. That it has been patented or described in some printed publication prior to his supposed invention or discovery thereof, or more than two years prior to his application for a patent therefor; or,*
SEC. 4887. No person shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid, by reason of its having been first patented or caused to be patented in a foreign country, unless the same has been introduced into public use in the United States for more than two years prior to the application. But every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years.	SEC. 4887. No person *otherwise entitled thereto* shall be debarred from receiving a patent for his invention or discovery, nor shall any patent be declared invalid, by reason of its having been first patented or caused to be patented by the inventor or his legal representatives or assigns in a foreign country, *unless the application for said foreign patent was filed more than seven months prior to the filing of the application in this country, in which case no patent shall be granted in this country.*
SEC. 4894. All applications for patents shall be completed and prepared for examination within two years after the filing of the application, and in default thereof, or upon failure of the applicant to prosecute the same within two years after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable.	SEC. 4894. All applications for patents shall be completed and prepared for examination within *one year* after the filing of the application, and in default thereof, or upon failure of the applicant to prosecute the same within *one year* after any action therein, of which notice shall have been given to the applicant, they shall be regarded as abandoned by the parties thereto, unless it be shown to the satisfaction of the Commissioner of Patents that such delay was unavoidable.
SEC. 4898. Every patent or any interest therein shall be assignable in law by an instrument in writing; and the patentee or his assigns or legal representatives may, in like manner, grant and convey an exclusive right under his patent to the whole or any specified part of the United States. An assignment, grant, or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the Patent Office within three months from the date thereof.	SEC. 4898. Every patent or any interest therein shall be assignable in law by an instrument in writing, and the patentee or his assigns or legal representatives may in like manner grant and convey an exclusive right under his patent to the whole or any specified part of the United States. An assignment, grant or conveyance shall be void as against any subsequent purchaser or mortgagee for a valuable consideration, without notice, unless it is recorded in the Patent Office within three months from the date thereof. *If any such assignment, grant, or conveyance of any patent shall be acknowledged before any notary public of the several States or Territories or the District of Columbia, or any commissioner of the United States Circuit Court, or before any secretary of legation or consular officer authorized to administer oaths or perform notarial acts under section seventeen hundred and fifty of the Revised Statutes, the certificate of such acknowledgment, under the hand and official seal of such notary or other officer, shall be prima facie evidence of the execution of such assignment, grant or conveyance.*
SEC. 4921. The several courts vested with jurisdiction of cases arising under the patent laws shall have power to grant injunctions according to the course and principles of courts of equity, to prevent the violation of any right secured by patent, on such terms as the court may deem reasonable; and upon a decree being rendered in any such case for an infringement, the complainant shall be entitled to recover, in addition to the profits to be accounted for by the defendant, the damages the complainant has sustained thereby; and the court shall assess the same or cause the same to be assessed under its direction. And the court shall have the same power to increase such damages, in its discretion, as is given to increase the damages found by verdicts in actions in the nature of actions of trespass upon the case.	SEC. 4921. The several courts vested with jurisdiction of cases arising under the patent laws shall have power to grant injunctions according to the course and principles of courts of equity, to prevent the violation of any right secured by patent, on such terms as the court may deem reasonable; and upon a decree being rendered in any such case for an infringement the complainant shall be entitled to recover, in addition to the profits to be accounted for by the defendant, the damages the complainant has sustained thereby; and the court shall assess the same or cause the same to be assessed under its direction. And the court shall have the same power to increase such damages, in its discretion, as is given to increase the damages found by verdicts in actions in the nature of actions of trespass upon the case. *But in any suit or action brought for the infringement of any patent there shall be no recovery of profits or damages for any infringement committed more than six years before the filing of the bill of complaint or the issuing of the writ in such suit or action, and this provision shall apply to existing causes of action.* SEC. 7. *That in every case where the head of any Department of the Government shall request the Commissioner of Patents to expedite the consideration of an application for a patent it shall be the duty of such head of a Department to be represented before the Commissioner in order to prevent the improper issue of a patent.* SEC. 8. That this Act shall take effect January first, eighteen hundred and ninety-eight, and sections one, two, three and four, amending sections forty-eight hundred and eighty-six, forty-nine hundred and twenty, forty-eight hundred and eighty-seven and forty-eight hundred and ninety-four of the Revised Statutes, shall not apply to any patent granted prior to said date, nor to any application filed prior to said date, nor to any patent granted on such an application. Approved, March 3, 1897.

ANOTHER NEW PATENT LAW.

An act defining the jurisdiction of the United States circuit courts in cases brought for the infringement of letters patent. H. R. 10,202.

Be it enacted, by the Senate and House of Representatives of the United States of America in Congress assembled, That in suits brought for the infringement of letters patent the circuit courts of the United States shall have jurisdiction, in law or in equity, in the district of which the defendant is an inhabitant, or in any district in which the defendant, whether a person, partnership, or corporation, shall have committed acts of infringement and have a regular and established place of business. If such suit is brought in a district of which the defendant is not an inhabitant, but in which such defendant has a regular and established place of business, service of process, summons, or subpœna upon the defendant may be made by service upon the agent or agents engaged in conducting such business in the district in which suit is brought.

Approved, March 3, 1897.

PATENT ATTORNEYS APPEAL.

Charges of violation of the law have been made by a number of local patent attorneys before Postmaster-General Wilson against the National Recorder, a periodical devoted to patents, and John Wedderburn & Co. The spokesmen were J. R. Edson, Walter R. Rogers, ex-Commissioner W. H. Doolittle, and Ernest Wilkinson, who claimed in substance that Wedderburn & Co. publish and circulate through the mails the National Recorder, which it was said had for its chief object the advertisement of a private business which is ostensibly that of securing patents for inventors. It was asked that the paper be barred from the mails as a fraud, and that a fraud order be issued against the company for obtaining money under false pretenses.

It was alleged that the company offers to subscribers prizes for valuable inventions; the originators of ideas in certain cases receive also from the firm certificates of patentability from a "board of experts." The prizes and certificates, it was claimed, by their manner of issue, are calculated to deceive inventors. Some fifty-five patent attorneys signed the charges left with the Postmaster-General. Among them were F. L. Middleton, F. L. Dyer, W. H. Myers, ex-Commissioner Ellis Spear, ex-Commissioner E. M. Marble, James L. Norris, Butterworth & Dowell, W. A. Bartlett, Whitaker & Prevost, Franklin Hough, V. R. Catlin, and E. B. Stocking.—Washington Post.

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American Excavations in Greece.

The American School of Classical Studies at Athens was founded in 1882 under the auspices of the Archæological Institute of America. It has enjoyed the steady favor of the Greek government. Its excavations have been prolific of results. A review of these by J. Gennadius appears in the January Forum, says the New York Sun. By 1885, when the finds made in Asia Minor by the Wolfe Expedition, so called because its expenses were borne by Miss C. L. Wolfe, of this city, had been added to those secured during the previous two years, M. Waddington wrote: "European scholars have hailed with delight the entrance of America into the old field of archæological research and will welcome such additions to our knowledge of Asia Minor as are contained in the account of the Wolfe Expedition." By this time Assos had been excavated and the site of the New Testament Lystra, as well as the sites of several ancient cities, determined.

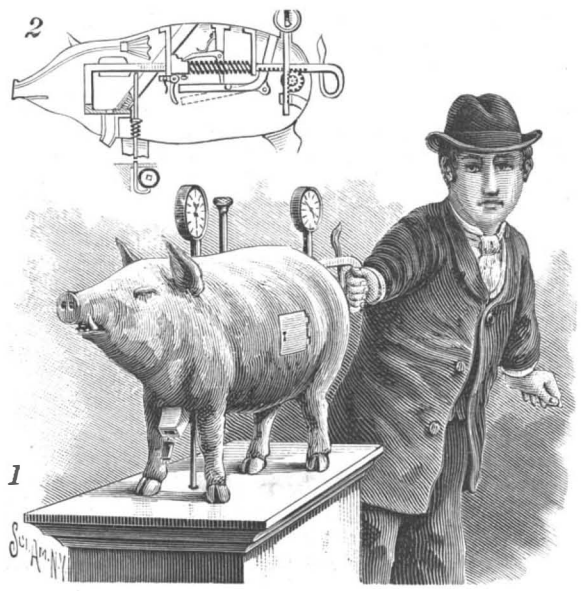
Systematic explorations may be said to have begun in 1886 at Thorikos, within easy reach of Athens, early celebrated in fable as the home of Kephalos, the lover of Prokris. It is referred to by Homer and Herodotus, as well as others, and had fallen into ruins before the first century of our era. The remains of Thorikos theater had long been a puzzle. The American excavations showed it to be nearly the smallest of Greek theaters known, responding to the needs and poor resources of a small rural community, with seating capacity for barely 5,000 spectators. There is no trace of a stage; the orchestra was a complete circle, showing that both choruses and actors performed on the floor of the orchestra. This crude rustic structure undoubtedly preserves the arrangement of the archaic Greek theater. In this same year the American school excavated the theater of Sicyon, where Hesiod places a contest between gods and men, a town that through out its duration was more famous as a center of art than of political activity. Its school of painting produced Apelles. The object of the American excavations was to obtain the plan of the Sicyon theater, one of the largest in Greece.

The two front rows of seats were found to consist, as usual, of seats of honor made of porous stone, each having a back and arms. As many as five other rows are cut in the rock. Fourteen stairways divide the auditorium into thirteen divisions. An elaborate drainage system forms a prominent feature of this theater adequate to carry off a heavy rainfall. But was drainage the sole purpose of an imposing aqueduct running under the orchestra and communicating with a line of earthen pipes under the stage? Complete excavation showed this to connect with a tank, and this tank was mainly intended for stage effects on the orchestra, the aqueduct also serving as a concealed passage way for the actors. Certain statements of Greek authors confirm this explanation. Certain large and small holes, worked at regular intervals in the stone floor, are shown to have served to secure the wooden columns of the early Greek stage.

An important discovery in connection with the history of architecture was that of two arched passages built without a trace of mortar or brick and corresponding with the masonry of the Hellenic walls that underlie the Roman work. These passages are therefore undisputable Greek work. When considered together with a similar instance in the Senate House of Olympia, they establish beyond a doubt the fact that the arch was not a Roman invention imported into Greece, but originated with the Greeks themselves, though used by them, as it would appear, only in underground structures. This review is only a beginning of all the work done by the American school, but it is at least suggestive of the value of its operations.

AUTOMATIC STRENGTH TESTER AND VENDING MACHINE.

The curious and novel nickel-in-the-slot machine shown in the accompanying illustration has recently been patented by Mr. John Milo, of Williamsbridge, New York City. As will be seen from the sectional view, the mechanism is inclosed in a case formed to represent some kind of animal, and it is so arranged



AUTOMATIC STRENGTH TESTER AND VENDING MACHINE.

that, by placing the purchase coin in a slot, and applying strength in the form of a pull or a blow to the proper handle, the force applied will be measured upon a dial and the article of purchase will be automatically delivered to the purchaser.

A horizontal bar extending longitudinally through the body terminates in a handle which is shaped to represent the tail of the animal. This is kept in its normal position by a coil spring. At its front end it is bent down and back to form a flat, horizontal plate, in which is cut a hole large enough to receive a package of the articles to be sold. This plate slides horizontally beneath the end of an inclined tube, which is filled with a supply of these packages, and when the bar is drawn forward the hole is brought beneath the end of the tube and receives one of the articles therefrom. Upon being released, the bar is drawn back by the coil spring and carries the article over an outlet tube, through which it falls and is delivered to the purchaser.

The purchase coin falls into an elbow tube, which is so pivoted that the weight of the coin causes it to rock forward and release a catch which prevents the horizontal bar from being moved, except when the coin is inserted. After releasing the catch, the coin rolls out of the tube into the body of the figure, from which it can be recovered by unlocking a door placed conveniently in the side of the machine. At the rear end of the bar is formed a suitable horizontal rack, whose teeth mesh with a pinion which in its turn serves to operate a vertical rack. The latter rack terminates in a rod, which, extending through the back of the animal, carries a pointer which indicates on a graduated scale the force of the pull.

At the forward end of the horizontal bar are attached two cams, one above and the other below. The first serves to compress a small bellows, which is arranged to produce a noise in imitation of the animal's cry. The lower cam depresses a rod which starts a music box concealed in the base of the machine.

The second indicator scale and the vertical rod shown projecting from between the shoulders of the animal are for registering the force of a blow. The internal mechanism is similar to that already described, the article being automatically presented to the purchaser as before.

THE BOSTON GAS EXPLOSION.

We have several times illustrated the Boston Subway, which is intended to give relief to the traffic on some of the densely crowded streets of that city by running the trolley cars in the subway.

One section of the subway is practically finished, but at the corner of Tremont and Boylston Streets the space between the roof of the subway and the street was left open to permit of some repairs being made to pipes, and the excavation left open was boarded over. For several days before the accident, which occurred on Thursday, March 4, at 11:43 A. M., the smell of gas had been noticed coming from this cutting, but little attention was paid to it. The corner where the accident occurred is one of the busiest in Boston. The explosion occurred just inside the Common, at the northwest corner of Tremont and Boylston Streets, which during the busy hours of the day is always thronged by pedestrians. The streets which come together at this point are two of the most important of the city's thoroughfares, and it was largely on account of the congested traffic at this point that the subway was undertaken. It is an everyday sight to see electric cars in a practically unbroken line extending along Tremont Street fronting the Common, and up Tremont Street beyond Boylston Street, toward the west, Boylston Street is equally crowded. The cutting, which was covered over by boards, was crossed by two six inch gas mains. It is believed that a spark from the wheels of an electric car caused the sad havoc which produced the most serious results ever caused by an illuminating gas explosion in the whole history of Boston, causing nine deaths. The exact moment of the explosion was indicated by many of the clocks in adjacent buildings, which were stopped by the shock.

The sidewalks were crowded and carriages and cars were passing in almost unbroken succession. A Mount Auburn car was rounding the curve from Boylston Street into Tremont Street, a Back Bay horse car was passing it in just the opposite direction, while a Brookline street car was crossing Tremont Street into Boylston Street. Just as the three cars were

SCENE OF THE BOSTON GAS EXPLOSION LOOKING TOWARD THE MASONIC TEMPLE.

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nearest the center of the junction of the two streets the gas became ignited in some way, probably by a spark between the track and one of the wheels of an electric car in passing around the curve, and the volume of gas which had collected under the tracks exploded with a boom like the report of a cannon. The flames shot up and blazed fiercely in the midst of the thoroughfare. The first car, which was precisely in the center when the explosion occurred, was lifted up by the wooden-work which covered the excavation. The car was carried far into the air, the wooden platform also carried along the two horses of the second car. Instantly the air was filled with flying debris and above the shouts of the terror stricken pedestrians could be heard the groans and cries of the wounded.

The first electric car no sooner fell back upon the tracks than it broke in half, and the whole portion immediately burst into flames, and the remains of it are shown in our engraving, which was made from a photograph taken ten minutes after the accident.

The Back Bay horse car was terribly shattered, as shown in our engraving. Two carriages were blown into atoms and the horses drawing them were killed. The drivers of the carriages, the conductor of the horse car, one occupant of each carriage, and a passenger on the electric car complete the list of those who were killed at once by the explosion. The motor man of the electric car and a passerby were both fatally wounded. It will probably never be known how many people were injured by the explosion, as many went away to their homes without obtaining medical attention from the ambulance surgeons who responded to the calls. It is believed that over fifty were seriously injured.

For two hundred feet in all directions from the spot where the explosion centered, plate glass windows were shattered and the buildings were shaken as if by an earthquake. The firemen at once responded to the call and one hundred and fifty policemen were required to keep back the crowd of spectators. Some of the timbers which covered the excavation were hurled two hundred feet in the air, falling on the roof of the new Hotel Touraine, and the falling electric trolley wires for quite a little distance in all directions from the central point of the explosion added to the terrors of the situation.

Ten minutes after the alarm had been sent a half dozen ambulances were on the spot, and in less than a half hour all of the dead and wounded had been removed. It was a great wonder that the casualties were not much greater. Some of the photographers in the immediate neighborhood were able to secure photographs within ten minutes of the time the accident had occurred, while the firemen were still at work trying to put out the fire. Our engravings are made from photographs taken by N. L. Stebbins. The scene during the first hour of the explosion could hardly be described in words. The column of fire in the opening in the street roared like the escaping gas from a natural gas well, and it was an hour before the blaze was conquered.

The question of responsibility is an interesting one, and the affair is being investigated by the State and civic authorities. It should be especially noted that the explosion was due to no fault of the subway itself, the explosion occurring in the space between the roof of the subway and the temporary surface of the street, composed of heavy timber and granite paving blocks. The subway has been examined by the chief engineer of that interesting engineering work, and was thought to be in perfect condition and not injured in any way by the explosion. None of the employes of the new Subway were hurt. Nearly 39 tons of glass were needed to take the place of the shattered fragments in the windows. The excavation has been filled in.

The cars were shifted by way of Washington Street and the debris was removed as quickly as possible. It was surprising to find 70 pound rails twisted, and frogs which were strongly bolted together broken as if they had only been pipe stems. The results of the explosion give an example of the terrific force of an explosive mixture of illuminating gas and air.

CARS WRECKED BY THE BOSTON GAS EXPLOSION.

INTERIOR OF THE WRECKED BACK BAY HORSE CAR.

Progress of the Trans-Siberian Railway.

The Siberian Railway is making rapid progress, according to an account by Mr. J. Y. Simpson in the January number of Blackwood. Sixty-two thousand workmen are employed—on the western section, Russians, Siberians, and Italians; on the eastern, convicts, Chinese, and Coreans. The best are the convicts, whose faithfulness is rewarded by the lessening of their terms of exile—a third, for instance, in one class. Technical schools for the education of engineers have been opened in three of the large towns on the line. Emigration has been encouraged by grants of land and low fares on the railways, with the result that a tide has set in from Russia far beyond the capacity of the road to handle. In the first five months of 1896 there passed through Tcheliabinsk alone 170,000 persons. Towns are sp inging up in great numbers along the western section, which runs through a "black earth" country. In anticipation of a great grain crop (Siberia raises now 432,000,000 pounds of grain for export) the government is constructing a railway to connect the Ob with the Dvina, so that the expensive transit through Russia to the Baltic or Black Sea may be avoided. A large sum has also been appropriated to improve the navigability of these rivers.

What Produces Prosperity?

Let me ask, says Mr. Andrew Carnegie in a recent address, under what conditions does the employer of labor make profits and become prosperous? Only when labor is prosperous, is his reply, and in great demand; when wages are the highest, and when the demand for his products are the greatest. Then, and then only, is the employer prosperous. On the other hand, when labor is not fully employed and can be obtained for the lowest wages; when there is little demand for his products, then the employer can never be prosperous. In most cases he must not only make profits, but he must see his capital impaired month after month, he cannot gain, he must lose. Before the employer can be prosperous, prosperity must exist throughout the land. He is never prosperous before prosperity comes; and he is prosperous only after it comes.

THE Cyclists' Touring Club in France has founded an Academie du Cycle et de l'Automobile for the encouragement of the inventive faculty among cycle and motor makers. A committee has been appointed, and it is intended to offer a prize of 2,000 f. for the best invention.

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Science Notes.

The Chanute prize of $100 for the best monograph on kites has been awarded by the Aeronautical Society to Prof. C. F. Marvin, of the United States Weather Bureau.

The odor of the sweet pea, according to a contributor to the Medical Record, "is so offensive to flies that it will drive them out of the sick room, though it is not usually in the slightest degree disagreeable to the patient." It is, therefore, recommended that sweet peas be placed in the sick room during fly time.

Mr. Alphonse Berget recently described a method of studying the expansion of liquids by means of photography. Two balances of equal sensibility, with their planes of oscillation at right angles, carry two weight thermometers, one containing the liquid under examination, and the other mercury. A ray of light is reflected from two mirrors, one on each beam, and this records on a sensitive plate a curve analogous to Lissajous' figures. This curve is the graphical representation of the expansion of the liquid.

A late circular issued from the Harvard College observatory includes, in its account of the most important recent discoveries, the spectrum of a star known as Zeta Puppis, its remarkable character being unlike that of any other yet obtained, the continuous spectrum containing three systems of lines—first, the dark hydrogen lines, such as are found in stars of the first type; second, two bright bands or lines, which may be identical with the adjacent lines in spectra of the fifth type; and third, a series of very faint lines. But the most important feature of this spectrum is a new element, not found on the earth or in any other stars, an element which, though similar to hydrogen, is yet distinctly different from it. Just what it is, or by what name to call it, astronomers are undecided, the marked peculiarity being noted that it produces a vibration systematic rather than accidental of three ten-millionths of a millimeter, and the action of which can be traced only on a specially prepared photographic plate. Another extraordinary discovery noted is a new variable star, in the constellation Crux, with a period of about a year.

Some interesting investigations have been made on the green color for which some Italian cheeses are so remarkable. This color is not, as has sometimes been supposed, due to the action of bacteria, but is a consequence of the presence of copper in the cheese. To produce a good Parmesan cheese, the milk must reach a high degree of acidity, and, while waiting for this proper pitch of acidity to be acquired, the milk in some parts of Italy is kept standing in copper vessels. During this period of repose the milk takes up considerable quantities of copper; indeed, it is customary to estimate the degree of acidity attained by the milk by noting the gradual disappearance of the brightness of the highly polished metallic surface. Dr. Mariani has examined twenty-five samples of green Parmesan cheese from various places, and has found that to about every two pounds of cheese there is present from 0·8 to 3·3 grains of copper. That this metal is solely responsible for the green color is evident from the fact that in the south of Italy cheese manufactured on the same principle, but in which the milk stands in tin lined instead of copper vessels, does not acquire any green color.

The Marquis of Salisbury recently received at the Foreign Office a deputation of representatives of science who asked the government to establish a national physical laboratory to cost $150,000 for the buildings and $25,000 a year for maintenance. The deputation consisted of Lord Rayleigh, Lord Lister, Sir John Evans, Sir Douglas Galton, Sir Henry Roscoe, Sir Andrew Noble, Prof. W. G. Adams, Prof. W. Chandler Roberts-Austen (Iron and Steel Institute), Prof. W. E. Ayrton, Mr. J. Wolfe Barry (President of the Civil Engineers), Prof. R. B. Clifton, Prof. G. H. Darwin, Mr. Francis Galton, Mr. R. T. Glazebrook, Prof. W. M. Hicks, Dr. J. Hopkinson, Prof. J. V. Jones, Prof. John Perry, Mr. W. H. Preece, Prof. William Ramsay, Prof. A. W. Rücker, Mr. Robert H. Scott (Meteorological Office), Mr. W. N. Shaw, Mr. J. Wilson Swan, Prof. Silvanus Thompson, Prof. W. A. Tilden, Prof. Michael Foster, and Mr. G. Griffith, Secretary of the British Association. Lord Lister said it fell to his lot to introduce the deputation as being president of the British Association, with which the idea of the national physical laboratory originated, and also of the Royal Society, which took an equal interest in the matter. Lord Kelvin desired him to say that he was unavoidably absent; he was in full sympathy with their object, and would have been present had it been possible. Addresses were made by Prof. Rücker, Lord Rayleigh, Sir Douglas Galton and Mr. J. Wolfe Barry. Lord Salisbury made a fitting reply, in which he admitted the weight of the arguments which had been submitted, but pleaded that the government was already heavily burdened with expenses; but he held out hopes to the deputation that it might be found possible in a great measure to concede to them the objects which they have in view, but he could not make any pledges at that time. Lord Lister thanked the prime minister, and the interview ended.

The New White Star Liner Oceanic.

In view of the exaggerated reports which have been published regarding the new White Star liner since we gave the first authorized announcement of her size and construction, we now publish, by the courtesy of Messrs. Ismay, Imrie & Company, the more exact details of her length and beam and some of the more important features of her design.

Next to her great size, the most striking feature in the new ship is the fact that no special effort will be made to surpass all previous records in the matter of speed. In this respect she will mark a new departure in the contest for the blue ribbon of the Atlantic. Hitherto, it is safe to say, speed has been made the first consideration, and to this all other elements, such as carrying capacity, comfort and economy, have been made strictly subordinate. Now, of all the features that go to make a first class Atlantic passenger ship, speed is by far the most costly, and when it exceeds 20 knots an hour, the most doubtful in its utility. The enormous sacrifice at which high speed is obtained is proverbial.

To drive the Oceanic at 27 knots an hour, at which, according to some reports, she is to travel, would require an outlay in machinery and a daily consumption of fuel that would render her as big a financial failure as the Great Eastern before her. This is evident from a comparison between the new ship and the Campania. The Campania is 600 feet long on the water line, 620 feet long over all, 65¼ feet in beam, 12,950 gross tonnage and 22 knots speed. The Oceanic will be 685 feet long on the water line, 704 feet long over all, 68 feet in beam and 18,000 gross tonnage. It will thus be seen that the Oceanic is to exceed the Campania in gross tonnage by nearly 40 per cent. Now at 22 knots speed the Campania indicates about 30,000 horse power, and burns say 450 tons per day. At 27 knots speed she would require about 55,000 horse power, and, if her engines and boilers showed the same relative efficiency, she would burn about 825 tons of coal per day.

From these figures it is evident that The Engineer, of London, was very wide of the mark when it stated, in a recent issue, that the Oceanic was to attain a speed of 27 knots with a horse power of 45,000 and on a coal consumption of 700 tons a day. To be capable of a sustained sea speed of 27 knots an hour, an 18,000 ton liner would require fully 70,000 horse power, and her coal consumption would reach fully 1,000 tons per day. This would mean that 5,000 tons of her displacement would have to be given up to fuel alone; and by the time the enormous weight of engines, boilers and auxiliary machinery had been provided for, there would be very little space left for the accommodation of mails and passengers, certainly not enough to save her from becoming a gigantic financial failure.

By giving the Oceanic sufficient horse power the White Star Company could, of course, insure that she would land her passengers in Liverpool on Tuesday evening. They consider, however, that by giving the great ship a speed well up to the present standard, so that she can make certain of reaching Liverpool and New York with great regularity early on Wednesday mornings, the comfort and convenience of the passengers will be equally well, if not better, served. The space which would otherwise be given up to machinery can be utilized in providing enlarged accommodation for the passengers, and it is the intention of the company to make a more liberal allowance of space in staterooms and elsewhere for each passenger than has ever been known on the Atlantic route.

The Oceanic will be an enlarged Teutonic. She will have two elliptical funnels, three masts and twin screws. These will overlap, the starboard shaft extending further aft than the other to give clearance for the propellers. The shafts will be carried out in a "spectacle frame," an arrangement in which the plating of the ship is built out and around the shaft, forming a tubular protection which extends up to the stuffing box gland, and allows the shaft to be inspected at all times. A long turtle deck will extend from the bow aft for over 150 feet. The dining saloon will be placed amidships, and above it will be an unusually large and handsome library.

Altogether, provision will be made for carrying 350 saloon passengers with such surroundings of comfort and luxury as have never been attempted before, and the provisions for the other classes of passengers will be on a similar scale.

Do Not Wet a Lead Pencil.

The practice of wetting a lead pencil on the tongue before using it is an unclean habit, to say the least, and perhaps also a dangerous one, says the Medical Review.

Recently a woman of fine bearing and elegantly dressed stepped into the counting room of one of the local papers of a large city to insert an advertisement. Having no pencil of her own, she picked up a pencil which was tied with a string to a pad used for writing. At once she moistened the lead with her tongue and began to write.

An elderly woman who was standing by reminded her that the pencil had just been used by an old man, ragged and dirty, greasy and filthy, who also had contracted the same habit of wetting the pencil on his tongue every time he wrote a word. The disgusted woman flung the pencil away and scolded the young man behind the counter until he sharpened a brand new pencil for her use and benefit.

The habit is a foolish one. Instead of making the pencil write more freely and easily, it hardens it and makes it write blurred and irregular.

Newspaper men and those who use lead pencils a great deal never dampen the lead in the mouth or with a sponge. Besides being injurious to the lead, it is a dangerous habit, inasmuch as disease has been known to be conveyed in that way into the system.

Russian Penal Settlements.

Dr. Benjamin Howard, who since 1859 has made a special study of penology, has arrived in England from a fourth visit to Russia and Siberia, undertaken for the purpose of confirming and bringing up to date the observations made by him in Saghalien and elsewhere since 1888. In the course of a conversation with a representative of Reuter's Agency, says the London Times, Dr. Howard touched upon some of the results of his investigations. He said:

"The special object of my last journey, which occupied six months, was to complete my studies regarding the recapture, redistribution, and means of forwarding Siberian exiles. I have been through every convict and exile prison between St. Petersburg and Siberia. I have waylaid exile gangs by road, rail and river, examined when empty the convict barges on which they were conveyed, and have had opportunities of speaking to every man on board when the boats have been full. For hundreds of consecutive miles I have kept observation on the gangs in order to see them under all conditions."

Asked concerning the result of his observations, Dr. Howard replied:

"In its main principle of productive labor the Russian penal system is worthy of imitation. In its general maladministration it is worthy of reprobation."

Asked to explain the strangely divergent accounts of Mr. De Windt and Mr. Kennan, he declined to confirm or deny such statements. He continued, "I can only speak of what I have seen. The administration of the Siberian system rests so largely with individuals that almost anything may be possible. Of all that is bad in Siberia proper, Saghalien has had the reputation of being by far the worst in every particular."

Comparing the lot of Siberian exiles with that of convicts in other countries, Dr. Howard remarked:

"The result of my experience has been to show that the treatment of a convict largely depends upon himself. After a Siberian exile's term of two years' imprisonment is over there is nothing to prevent him in three to five years from becoming, within certain geographical limits, a free man. This shows good in a general way, with very special exceptions. Escape from Saghalien is practically impossible. A political exile or a murderer in Saghalien lives with his family in a well built, and often pretty, four-roomed cottage, with its vestibule and garden. The island is populated mostly by murderers or by persons guilty of similarly serious crimes. They work peaceably and quietly on their farms, and walk about the streets to all appearance free men. You go into the bureaux of the prisons and you see men writing at rows of desks. Their general demeanor and the appearance of the place is not unlike that you would see in offices in any part of the world. Yet each man is probably a convicted murderer. Russian convicts, instead of being a heavy charge on the resources of the country, are a source of revenue. Convict labor has added to the Russian empire an island the length of England, not an acre of which was previously under cultivation, and it is only the population of Siberia by these people that has made possible the line of the Trans-Siberian Railway—the envy of the whole world." In conclusion, Dr. Howard said: "The main lesson to be drawn from this system is the absolute futility of punishment for its sake alone. The first principle taught is that of self-maintenance. Convict labor should be productive of a net profit to the state, so that instead (as in England, for instance) of costing many millions, it should prove a source of annual revenue by putting in force organized forms of industry suited to the capacity of the respective criminals. By the means employed in Siberia the convicts do not lose all self-respect, and are often better fitted than before to become useful members of society. In the English and some other prison systems the outcome is generally the opposite. The result of the convict's incarceration and of the useless forms of labor on which he has been employed has often been merely to generate a vengeful feeling which tends to render him a habitual criminal."

An effort is to be made to place the Aeronautical Society of England more prominently before the public by the issue of a serial quarterly, if not more frequently, containing reports of the meetings of the society, original articles, and records of the doings of aeronauts at home and abroad. The honorable secretary of the society is Capt. B. Baden-Powell.

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Correspondence.

Kind Words from an Inventor.

To the Editor of the SCIENTIFIC AMERICAN:

I am pleased to acknowledge the receipt of the patent on typewriter attachment which you succeeded in obtaining for me. The next thing will be to make something out of it, if possible. The reference which you make in the SCIENTIFIC AMERICAN will be invaluable in making its existence known. I will add that I began taking the SCIENTIFIC AMERICAN when a boy long prior to the date when you published the articles on mechanical drawing by Prof. MacCord, and for years I considered the paper as almost necessary to my existence, and I will frankly state that much of the money which I have made in later years has been a result of information gained from the study of the paper in years past. I consider it to be one of the greatest educational factors, and well known though it be, it is not as well known as it should be. It ought to be in the possession of every boy in the land.

Minneapolis, Minn. W. P. BUTLER.

Unique Magnetic Experiment.

Some time ago Folgheraiter began testing old Pompeiian and Tuscan vases with the view to determining their polarity, his theory being that they would retain the same direction of magnetization as when baked, and that this would correspond with the magnetic dip at that time. He has now completed, for the present, this investigation. Speaking of this, the London Electrician says:

A unique interest attaches to this work. It will be remembered that he was trying to discover the magnetic dip, say, at the time of Romulus, by the present magnetization of Tuscan vases. He proved that the clay they are made of is magnetized in the direction of the earth's magnetic force during firing, and retains that magnetism indefinitely after cooling. Some of these vases, notably the wine jugs, oinochoai, could only stand upright in the furnace, and might, therefore, serve as self-registering indicators of the magnetic dip. Now, the most curious fact brought to light is that the north-seeking pole of these vases has a variety of dips from 25° above to 25° below the horizon, but never more than that. Hence, our author argues the dip cannot have been anything like its present value (60° at Florence) at the time of the Roman kings. He is inclined to think that the north-seeking pole pointed a few degrees above the horizon in the eighth century B. C., and that the needle was (or would have been, had it existed) horizontal a few centuries afterward.

Andree's Balloon Voyage.

The government of Sweden has notified the Canadian government that Herr Andree will start from Stockholm about the end of June for Spitzbergen to attempt his balloon voyage to the North Pole, and it requests that instructions be given to Canadian officials at different points in the Northwest Territories and Hudson Bay region to report the balloon if it is sighted. Herr Andree has the hearty support of the Swedish government, and he will go to Spitzbergen this year at the public expense in a government vessel. His balloon house and much of his equipment is at Dane's Island, on the northwest coast of Spitzbergen. It is to his advantage that most of the preliminary work required before he can start in his balloon is already done. The complaint was made last summer that the men who put up his balloon house, eighty feet high, were not the speediest of workmen, and that before he was ready to start the few days of favorable weather had passed, and then the unintermitting north wind, that would have carried his airship south, defeated his hopes entirely.

The balloon house, well built, well anchored, and sheltered on one side by a high hill, is believed to have passed the winter in good shape and to be now ready for his occupancy; so he has not before him this season the five weeks of work that were required to put up the house last year.

Herr Andree will carry about four months' supplies of food with him, in addition to his boat, a folding affair that packs away neatly above his car, his sledges, and other equipment. If he has a good wind from the south, he thinks he will be in the neighborhood of the North Pole in a day and a half to two days after starting. His hope is that he will be carried across the polar area. What he wants is a south wind with a slowly falling barometer, for he believes that under such conditions the wind will persist in the right direction as long as he has need of it.

Even if Andree crosses the polar area and lives to get back, the difficulty will be to do any exploring that will amount to much. It is not likely that from a balloon he can make more than the slightest kind of a reconnaissance. Suppose he drifts across the unknown area north of America and discovers land masses. He will not be able to map them in any satisfactory way, and is not likely to tell much about them except to report their existence.

One of the most interesting questions to be solved when Mr. Peary's plan for completing exploration between Greenland and the North Pole is carried out, is whether the deep sea discovered by Nansen, and traced to the north of Franz Josef Land, extends into American Arctic waters. That question and many others that still make polar research worth while cannot be settled from a balloon.

Recent Patent and Trade Mark Decisions.

Griswold v. Seymour, Comr. (Ct. of Ap. D. C.), 78 Of. Gaz., 482.

Bale Ties.—It has been held that there is no novelty, in view of the prior art, in making a tie or band, one end of which is twisted into an oval loop formed of the wire itself, the lower end of the loop being narrowed into an angle no larger than the diameter of the wire, so that in use the free end of the wire, after being brought around the bale and introduced into the loop, is then pulled or jerked down into the angle and wrapped about the wire.

Aggregation.—Where a V-shaped loop has been used in bale ties so that the free end of the wire could be secured in the angle of the loop and where otherwise formed loops have been made integral with the wire or band, there is no invention in combining the two features in the same patent so that the V-shaped loop would be integral with the band.

Hien v. Pungs (Ct. of Ap. D. C.), 78 Of. Gaz., 484.

Rehearings.—Court endeavors to bring to a case in the first instance the best judgment it possesses, so that its decision should have the element of stability; therefore it is unjust to the court and parties that an argument should be held back by the counsel until after the decision for the purpose of using it only at a rehearing, and in such case a rehearing will be refused.

Snyder v. Fisher (Ct. of Ap. D. C.), 78 Of. Gaz., 485.

What Amounts to Invention.—Just where the line of invention lies in an accomplished result is difficult to determine, but it must extend beyond the mere novel and useful and into the domain of original thought, although the extent of the mental process is immaterial, as is also the question whether the result came out of long consideration or was the revelation of a flash of thought. Simplicity does not negative invention.

Briggs v. Seymour, Comr. (Ct. of Ap. D. C.), 78 Of. Gaz., 169.

Construction of Claims.—A claim relating to a new invention is entitled to considerable latitude of construction, but where the claims are for the same subject matter as prior patents, and especially where the same person is applying for the patent, the construction must be strict and narrow.

Foreign Art.—There is no invention in applying to an ice planing machine a construction of cutter head old in wood planing machines, as the uses are analogous, and the decision in Potts v. Creager does not apply.

Hill v. Parmalee (Ct. of Ap. D. C.), 78 Of. Gaz., 170.

Evidence in Interference Cases.—In this case Parmalee had a patent issued eight months before Hill applied for one, and the latter delayed the filing of any claim until more than seventeen months after having reduced the invention to practice. It, therefore, is incumbent upon Hill to make out his case beyond all reasonable doubt in order to succeed.

Admission by Contract.—In this case Hill and his assignee, for four months after their alleged discovery of Parmalee's patent, admitted the validity of the latter's invention, for Parmalee, during such time, was in the course of executing a contract with the assignee regarding the patent, and with the knowledge and concurrence of Hill, and neither Hill nor his assignee intimated that Parmalee was not the true inventor and had taken it from Hill. Hill's case was made worse because it seems that this interference proceeding was brought on after Parmalee's refusal to accept the proposition of Hill's assignee in order to compel him to do so.

Walter Baker & Company v. Baker (C. C., Va.), 77 Fed., 181.

The Use of One's Own Name in Trade.—Any man has a right to use his own name in connection with any business he honestly desires to carry on, but he will not be allowed to use it in such a way as to injure another having the same name; and equity will direct him how he shall use his name to denote his individuality. In this suit parties named Baker began in 1780 to make and sell preparations of chocolate at Dorchester, Mass., and the business has been carried on ever since at that place. The goods made have been put up in various forms and bearing the word "Baker" in connection with the name of the place and time of establishment. In 1894 a citizen of Winchester, Va., named Baker began making chocolate goods, putting them in packages with marks and labels much like the Massachusetts parties' and bearing also the words "W. H. Baker & Co., Winchester, Va., Established in Mercantile Business in 1785." The latter date was used because his ancestors or some of his kindred had been engaged in the wholesale business since about that time. It was held to be unfair competition. The court restrained the defendant from using in connection with his name the words "Established in Mercantile Business in 1785," and also from using yellow labels and otherwise using his name so that it would be confused with plaintiff's name.

"German Sweet Chocolate" as a Trade Mark.—The words "German Sweet Chocolate," especially where the word "German" is the name of a man and is not intended to be geographical, is a valid trade name and is infringed by the words "Germania Sweet Chocolate."

Unfair Competition.—One who enters into competition with another and older firm with the same name and same business is under obligation to more widely differentiate his goods from that of the older firm than is required of third persons.

Tannage Patent Company v. Adams (U. S. C. C., Pa.), 77 Fed., 191.

Process for Tawing Leather.—The Schultz patents, Nos. 291,784 and 291,785, for process of tawing leather, on a hearing on motion for preliminary injunction, were held not to have been anticipated by the Francillon English patent of 1853, each relating to dyeing and printing silk, wool, and other animal fibers.

Preliminary Injunction.—When the patent has been sustained by the Circuit Court of Appeals, the only question to consider on motion for a preliminary injunction in another suit on the patent is that of infringement, unless there is new evidence of such conclusive character that, if it had been introduced in the former case, would have overthrown the patent, and the burden of establishing such new evidence is on the defendant, against whom, in such case, every reasonable doubt is to be resolved.

American Graphophone Company v. Leeds (U. S. C. C., N. Y.), 77 Fed., 193.

Preliminary Injunction.—A decision sustaining a patent is not conclusive on a motion for a preliminary injunction in a suit on the patent in another circuit, where a decisive question raised in the latter suit was not contested in the former or a motion for a reargument for the purpose of raising this point has been entertained but not yet decided.

Western Wheel Scraper Company v. Dinnin (U. S. C. C., Ill.), 78 Fed., 194.

Road Scrapers.—The Welch patents, Nos. 379,550 and 380,068, for improvements in wheeled road scrapers consisting of the combination of old elements to produce a machine in which vertical, horizontal, and angular adjustments may be made by the man who rides it without stopping the machine, have been held valid and infringed by a device containing all the substantial elements except that rods are substituted for chains for changing the position of the scraper blades.

Invention.—While all the elements of a road scraper may be old and the ultimate result old, if one has so organized these old elements, as a whole, that vertical, horizontal, and angular adjustment of the scraper blade was effected without stopping the scraper, and were used instead of clumsy manual manipulation, a distinct advance in the art is shown. The concatenation of old elements differs and clumsiness of adjustment is more than mere mechanical adaptation. It is the conception, the invention, the mental creation which manifests itself in properly organizing old means for a new purpose.

Novelty.—The fact that defendant copied the device shown in the patent almost complete is evidence tending to show novelty and usefulness.

Two Patents on the Same Thing.—Where two patents seem to be but separate expressions of the same conception, the latter enlarging the conception of the former, the validity of both will be sustained.

The Life Saving Service.

The United States Life Saving Service, in its annual report for 1895, states that there are 251 life saving stations on the Atlantic, Gulf, and Pacific coasts, and the Great Lakes; 184 of these being on the Atlantic coast line. There is but one river station, at the falls of the Ohio, at Louisville, Ky. During the year, 675 disasters to vessels on these coasts were reported, involving property valued at $10,725,175. Of this property nine-tenths was saved by the life saving stations and salvage and wrecking companies working together. These disasters involved the lives of 5,823 persons, with only 26 lives actually lost. Of the 675 vessels in jeopardy, 73 were lost. On the New Jersey coast, with 49 stations, about 1,000 persons were on board ships in danger, and only one life was lost, and only $83,535 worth of property was lost out of the $2,000,000 worth in peril. The total net expenditure for the service in 1895 was $1,285,577.

Trans-Mississippi Exhibition.

The Trans-Mississippi Exposition at Omaha will have nine main buildings. This was determined at a recent meeting of the executive committee. The buildings are to be as follows: Building No. 1, Agriculture, Horticulture, and Forestry; No. 2, Mines and Mining; No. 3, Manufactures and Liberal Arts; No. 4, Fine Arts; No. 5, Electricity and Machinery; No. 6, Auditorium (made after the model of the Salt Lake Temple); No. 7, the Nebraska building; No. 8, Grand Army of the Republic building; No. 9, the Silver Palace.

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ALEXANDER HERRMANN PRESTIDIGITATOR.

BY W. E. ROBINSON.

The late Alexander Herrmann, the subject of this article, was born in Paris, France, February 11, 1843, and died in his own private car on December 17, 1896, while en route from Rochester, N. Y., to Bradford, Pa.

He came of a family of great prestidigitators. His father Samuel Herrmann being the first of that name, also the original of the modern magician to use the word "prestidigitator" as a title of his profession. Samuel Herrmann was the most famous conjuror of his day and a great favorite of the Sultan of Turkey, who, whenever feeling indisposed, would invariably send for him and pay a princely sum to be entertained by this man of magic.

The next in the family to pick up the magic wand was Carl Herrmann, who was the first of the Herrmanns to visit America, likewise the first to use and introduce the name prestidigitator in this country. Carl was Alexander's eldest brother and achieved great success in the world of magic, and at the time of his death, which occurred June 8, 1887, at Carlsbad, Germany, left behind a large fortune. Carl and Alexander came of a family of sixteen children, Carl the eldest and Alexander the youngest.

After Carl took up magic as a profession, the father retired and took up the study and practice of medicine.

It was the father's fondest hopes to make of his youngest and favorite son Alexander a physician, but fate decreed it otherwise; the youngster's mind did not bear in that direction, but in the same channel as the brother's, and that was magic. His whole desire and ambition was to become a magician. Like father like son. He coaxed his brother to accept him as his assistant, and finally one day young Alexander was missing. The fact was he had been kidnapped and taken away by Carl, with whom he made his first public appearance at the age of eight, at a performance given by Carl in St. Petersburg, Russia. Even at that early age his great dexterity and ingenuity and presence of mind were simply marvelous, and his brother benefited greatly by his genius and built castles in the air of the great future in store for them both; but his dreams were rudely awakened by the sudden appearance of the father, who had traced their whereabouts and immediately returned home, taking Alexander with him.

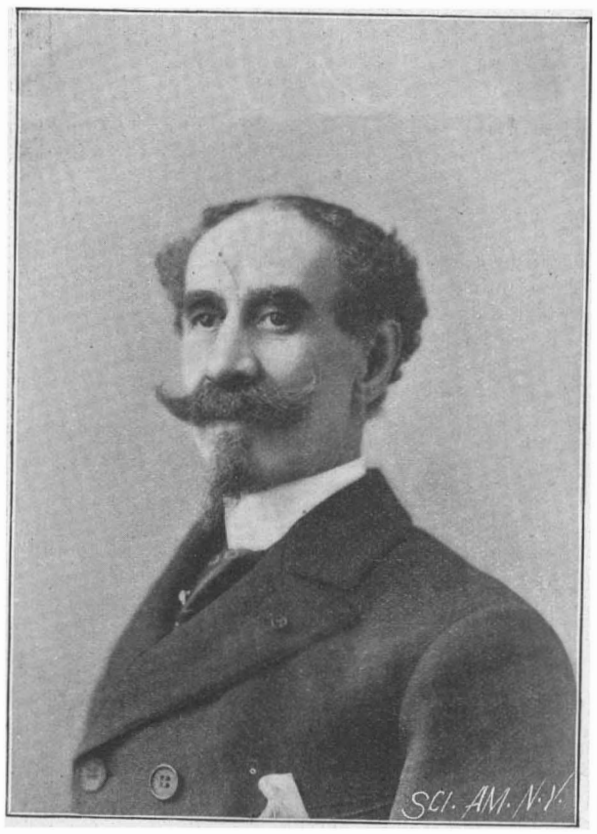
But the youth's attention could not be diverted from his chosen profession. His mind and thoughts were ever about it, and one day he was again found wanting, it afterward having been proved that he had written to his brother, who sent for him. This time the father made a compromise with Carl, stating that if Alexander's education be not neglected, he could continue with Carl, who thereupon engaged two competent tutors to travel with and instruct the young prodigy. For six years the brothers worked together, visiting Spain, France, Germany, Russia, and the surrounding countries. And then again the parents had Alexander taken away and put to school at the University of Vienna to finish his education. But at the age of sixteen the old desire and fascination for magic possessed him, and having received a proposal from his brother to join forces and make a tour of the world, he again ran away from the old folks.

Their first appearance in America was at the Academy of Music on Monday, September 16, 1861. After touring this country a short while they left it, returning again at two different times, once, Monday, September 11, 1865, and the next time Monday, September 20, 1869. This was the opening night of their last joint engagement, and on this night Carl introduced Alexander to the audience as his brother and successor. After this engagement Carl continued a short tour of this country, while Alexander went to Europe, where he appeared in the principal cities, and also made a tour of the Brazils and South America, and also made a remarkable run of one thousand performances at the Egyptian Hall, London, England, after which he returned to the United States in the year 1874; since which time he had made this country his home, becoming a naturalized citizen in Boston, Mass., in the year 1876. His career as a magician was one uninterrupted success, and I doubt if any man was more of a public character than himself.

Herrmann had a remarkable resemblance to his "Satanic Majesty," and he cultivated the likeness as much as possible, well knowing the public ideal of a magician was one who looked like the "old boy."

His aspect was not forbidding, however. He was ever genial and kind to those about him. He had a thin face and sharp, piercing black eyes, and added to this a pointed beard or goatee, and a heavy mustache curled up at the points, and a head of curly hair; such a man looked the magician, and the public expected him to do things magical as a matter of course, and it is safe to say, in no way were they disappointed. "Magicians are born, not made," was a favorite expression of his, and Dame Nature certainly had him in view for one when she brought him to this sphere.

His success lay not only in his skill as a manipulator, but also in his witty remarks and ever-running fire of good-natured small talk. He was a great conjuror and clever comedian, and a fine actor, for he was playing the part of a magician in this play of life and acted it well. Carl Herrmann was very sedate, and presented his magic more in the manner of a scientific lecture, and always on the mysterious and tragic side, whereas Alexander was ever gay, his tricks one and all had a happy or mirthful ending, he was always striving to make the public laugh as well as mystify them. Carl

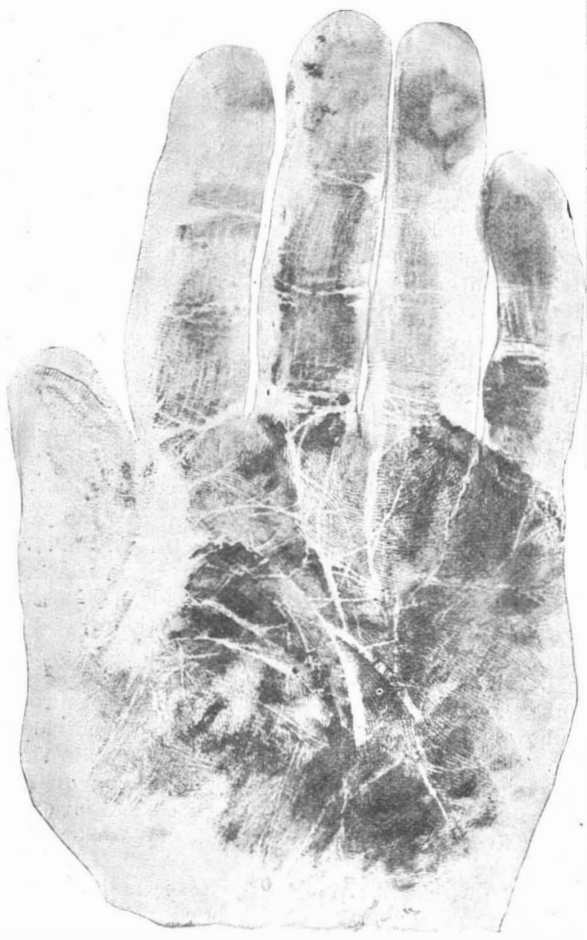


ALEXANDER HERRMANN.

presented magic as a drama, Alexander as a comedy, and it is doubtful if any conjuror has done more to elevate the art and bring it to a successful recognition as a healthful, innocent amusement than he has. His hands were trained to a marvelous state of responsiveness. His misdirection, as it is termed in magician's parlance, was simply beyond description. If his eyes looked in a certain direction, yours were bound to follow them, as if compelled to do so by some mysterious power.

Herrmann's pet hobby was hypnotism, and he was a master of that weird science, and attributed many of his successful feats at private as well as public performance to its use, although he never gave public demonstrations of it.

Herrmann's great forte was cards; not only was he



IMPRESSION OF HERRMANN'S HAND.

master of the ordinary tricks of causing cards to disappear, to again reappear under some strangers' vests or in their pockets, but he could also with the greatest ease and grace distribute them about a theater with great accuracy; sending them time and time again into the very laps and hands of individuals asking for them.

By long practice Herrmann was able to tear a deck of fifty-two cards, evenly stacked up, first into halves and then into quarters, almost as clean as if done with a knife. It was while performing before Nicholas, the Czar of all the Russias, that he made a great impression with this feat. At the conclusion of his entertainment, the Czar complimented Herrmann upon his skill, and also decorated him, at the same time smilingly remarking he would show Herrmann a trick. The Czar, who was a man of wonderful strength, in fact most Russians are, took up a pack of cards and tore them in half, and with good humor asked Herrmann what he thought of it, and if he could duplicate it. What was his surprise to see Herrmann take one of the halves of the deck and tear it into quarters. Herrmann was as clever with his tongue as he was with his hands. He had mastered French, German, Spanish, Italian, Russian, Dutch and English, which he spoke with that delightful accent we all liked to hear. He also had a fair knowledge of Portuguese, Chinese, Arabic and Swedish. He had received jewels and been decorated by almost every sovereign of Europe, among which were a cross from the King of Belgium, one from the late King of Spain, a ring from King of Portugal, another from Prince of Wales, and various other gems and medals.

It was at private entertainments, clubs, and like places, that one had a chance to see Herrmann's true skill as a prestidigitator. For it was then he worked impromptu, and of course without any apparatus, simply depending upon his manual dexterity. One trick that caused more talk and wonderment than the rest was the vanishing glass of wine. Just as he would place a wine glass, full to its brim with sparkling wine, to his lips, he would give a sudden look of surprise, and an exclamation, and lo! the glass of wine had disappeared from his hand, only to be reproduced immediately from some bystander's coat tail pocket.

He would also abstract from a person's finger a ring, which had just been placed there by Herrmann, while all eyes were gazing at it. Another clever deception was the changing of a silver dollar into a twenty dollar gold piece. He would also cause to disappear a magnum bottle of champagne, holding about two quarts, and then take it from under a gentleman's coat. These are a few of the countless number of pure sleight of hand tricks with which he was identified. He was also a very good ventriloquist and imitator of birds, and quite clever with his hands at juggling and hand shadows, but these were simply for his own amusement and practice.

The lines in his hands were the most wonderful students of cheirography and professors of palmistry had ever seen. They claim his power of imagination must have been nothing short of miraculous, as he was the possessor of three lines of imagination, instead of one. The lines also denote a generous heart, a seeker after friendship, a determined nature, and a man who would have made a good painter or musician.

The hands of Herrmann were slender and tapering, very much like a lady's hand. The impression of his hand was taken a few days after his death, and appears to be a short hand. This is accounted for by the fact that the hands had become slightly curled inward, consequently the foreshortening of the same in the picture.

The name of Herrmann, let us hope, will, like the brook, go on forever. Leon Herrmann, a nephew of the deceased, who resembles him very closely, is now in America, having taken up the work of magic where his uncle had left off.

Insanity and Tuberculosis Among Negroes.

A correspondent of the Lancet says previously to the abolition of slavery there was very little tuberculosis or insanity in America among the negroes of the Southern States, who were observed to enjoy a remarkable immunity from both affections. After emancipation they appeared to quickly lose this immunity, and at the present time are exceedingly susceptible to both. Formerly, although in a state of slavery, they are said to have been well cared for, compelled to lead orderly, regular lives, and kept from dissipation and excess. Freedom removed these restraints, and they quickly plunged into riotous and vicious habits. A physician who has investigated the subject writes in a transatlantic contemporary that "the rapid increase of insanity and consumption in this race is due to a combination of causes and conditions. They have developed a highly insane, consumptive, syphilitic, and alcoholic constitution which predisposes them to diseases they were formerly free from. In this disturbed and unstable condition they seem to be totally unable to resist the slightest excitement. Recent mortality returns show that the death rate of the colored people from tuberculosis is three times as high as that of the whites."

FRANCE seems to be bent on conquest in Abyssinia. Besides Prince Henri of Orleans' expeditions, two others, one headed by M. Bouvalot, the other sent out by the French Upper Nile Company, have just left France for Menelek's country.

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COMPRESSED AIR SYSTEM ON THE UNITED STATES MONITOR TERROR.

(Continued from first page.)

that was claimed, we may look for its further adoption among the navies of the world.

The air for driving the various pneumatic devices is compressed by two separate engines, one being placed in the hold near the forward turret and the other near the after turret on the berth deck. The working pressure is 125 pounds per square inch, and there is no reservoir for the air except an eight-inch pipe, which runs through the vessel and supplies the two turrets and also the steering device in the steering room at the extreme after end of the ship. These two engines supply sufficient air for turning the turrets, elevating the guns, lifting the ammunition into the cages, raising the cages to the breech of the gun, ramming home the charge, closing the breech, checking the recoil, and, lastly, and most important operation of all, steering the ship itself.

The two turning engines are placed upon the floor of the turret, one on each side of the big guns. Each engine has two cylinders, 8 inches in diameter by 14 inches stroke. A worm on the crank shaft operates a set of gears by which the power is multiplied many times over before it reaches a driving pinion, which, in common with the engine and gears, is firmly bolted to the framing of the turret and of course turns with it. The pinion meshes with a large circular rack which is bolted to the deck of the ship and lies immediately within the circular steel track upon which the turret rotates. The engines are controlled by suitable levers and hand wheels situated within easy reach of the officer in the sighting hood, the latter being placed over and between the guns, as shown in the sectional view, Fig. 1.

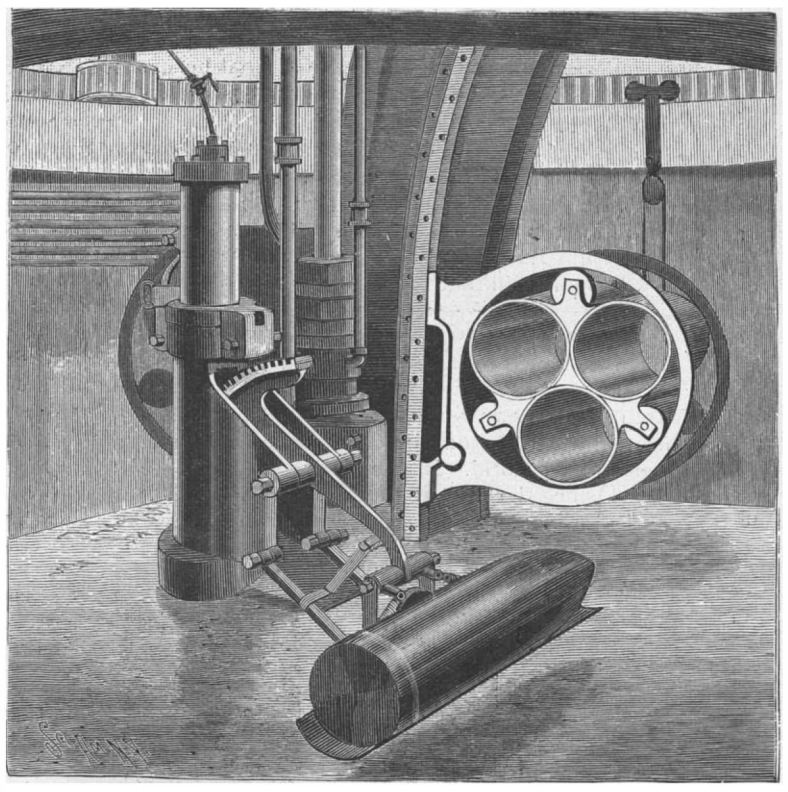

Fig. 3.—HANDLING ROOM OF THE MONITOR TERROR—PNEUMATIC LIFT FOR LOADING CHARGE INTO CAGE OF AMMUNITION HOIST.

The elevation and depression of the gun is effected by means of a massive ram, which is hinged to the floor of the turret and bears against a shoe on the under side of the gun carriage near the breech of the gun. On each side of the turret is a cylinder containing glycerine and water, a portion of which, when the gun is to be elevated, is forced by compressed air into the ram, the supply being regulated by valves which are operated by means of levers in the sighting station above mentioned.

By reference to the large sectional view of the turret, Fig. 1, the reader can obtain a clear idea of the method adopted for sighting the great 10 inch guns. From the forward end of the massive gun carriage, a small vertical rod is carried up to a bell-crank lever situated near the roof of the turret. Another rod extends from the short arm of the lever and is connected to another bell-crank lever attached to the sighting hood. The long arm of this lever carries a sighting telescope which is placed opposite one of the narrow horizontal slits which are cut through the side of the hood. The system of levers is so proportioned that the axis of the telescope and the axis of the gun will always be parallel, any change in the elevation or training of the gun being accompanied by a similar change in the position of the telescope. With his eye at the telescope and his hand upon the levers which control the air valves of the turning and elevating machinery, the officer brings the cross hairs of the telescope to bear upon the mark, and by pressing an electric button hurls a 500 pound steel projectile with unerring precision at the hostile ship.

Immediately below the turret is the handling room, adjoining which are the magazine and the shell rooms, with which it communicates through doorways which, when not in use, are closed by watertight doors. Directly below the center of the turret is a pneumatic loading machine, which rotates upon a vertical shaft, and may be swung to the right or left as desired. The 500 pound shell and the cartridge, the latter in two parts, are run out from their respective rooms on an overhead trolley and placed in the tray of the loading machine, as shown in Figs. 1 and 3. The tray is pivotally attached to the body of the machine by a set of parallel rods and a lever which carries at its inner end a circular rack. Above the rack is an air cylinder whose piston rod terminates in a vertical rack which engages the circular rack before mentioned. By admitting air at the top of the cylinder, the tray with its load is raised to the required height and the latter is placed in the pockets of the loading car.

There are two of these cars, one for each gun, and they travel upon two vertical hoists or trackways which lead up to the breech of the guns. The hoisting is done by two pneumatic cylinders located on the floor of the turret between the guns. Attached to each piston rod and beneath each cylinder is a set of multiplying sheaves. Over these passes a wire rope, one end of which is fastened to the floor of the turret, the other end being carried to the loading car. The speed of the rope is so adjusted that the full stroke of the pistons will serve to hoist the loading car from the floor of the handling room to the breech of the gun. By reference to Fig. 3, it will be seen that the loading car contains three parallel pockets, which rotate within the frame of the car, friction wheels being interposed to facilitate the movement. One of the pockets carries the shell and the other two the powder charge. The car is automatically brought to a stop with the lowest pocket containing the shell immediately in line with the breech of the gun.

It is then pushed home by a telescopic rammer which is operated by compressed air, the valve which admits the air being worked by a man who sits astride of the cylinder. It will be noticed that the rammer is carried by a bracket bolted to an extension of the gun carriage, and it is consequently held at all times in true line with the bore of the gun. After the shell has been rammed home, the loading car is rotated and the two sections of the powder cartridge are brought successively opposite the breech and pushed home. The breech plug is then swung round, thrust into place and locked.

The recoil of the gun is controlled by two pneumatic cylinders, 14 inches in diameter and 40 inches in length. The cylinders, whose heads can be seen in Fig. 2, below the breech, are secured to the gun carriage and the pistons to the gun. Before firing, the pressure on the recoil side of the pistons is about 500 pounds per square inch. As the gun recoils, carrying the pistons with it, this pressure is rapidly increased by compression. To reduce the pressure at the end of the recoil, a tapered rod is provided, which passes through the center of the piston and allows the air to pass more and more freely to the counter side of the piston as the gun returns. The residual pressure is utilized to return the gun to its firing position. Perhaps there is no part of the many operations performed by compressed air on the Terror in which the power shows to better advantage—the elasticity of the air preventing all shock and providing an easy cushion in the recoil and counter recoil.

The last and most important duty performed by the compressed air is that of steering the ship. The interior of the steering room is shown in Fig. 4, and the work is performed by the two long horizontal cylinders which will be noticed arranged one on each side of the tiller. They are provided with a common piston rod, in the center of which is a hollow crosshead in which the tiller is free to slide as it is swung right or left by the movement of the pistons. Compressed air is admitted to the outer ends of the cylinders by means of a D valve, the air being simultaneously admitted at the back of one piston and exhausted from the other, according as the helm is to be put over to port or to starboard. Air is also admitted at all times at the inner ends of the cylinders, and a pipe connects them, so that as the pistons move, the air may flow freely from the inner end of one cylinder to the inner end of the other. In the center of the connecting pipe is a bypass valve, which is open when the tiller is being moved, but closes when it has been traversed the desired angle and holds the air imprisoned in the cylinders, thus locking the tiller between two elastic cushions. The heavy shocks to which the tiller is subject in rough weather will thus be received and absorbed by the air, and the framing of the ship will be proportionately relieved of the strain.

Provision is also made for steering the ship by electricity or by hand power. For the latter purpose an auxiliary tiller, which can be quickly coupled to the rudder head, is placed above the pneumatic cylinders. It is operated by means of an endless wire rope which passes through sheaves at the end of the tiller and round a drum attached to the deck beams overhead. The drum is controlled through a chain and sprocket gear by the large hand steering wheel shown in the engraving. The steering may also be controlled by an electric motor which is located in the same compartment. The shaft which operates the valve of the pneumatic cylinders has three clutches upon it, by manipulation of which the steering may be carried on by electrical connections from the pilot house or from either of the turrets. During the tests of last November the rudder was turned from hard a-port to hard a-starboard in the very short time of six seconds. In testing the turret engines, the air was exhausted from the receiver and the compressor was started. In a few seconds the 250 ton turret began to move, and in 45 seconds the full working pressure of 125 pounds to the square inch was realized. It took 52 seconds to swing both turrets completely around their full arc of training.

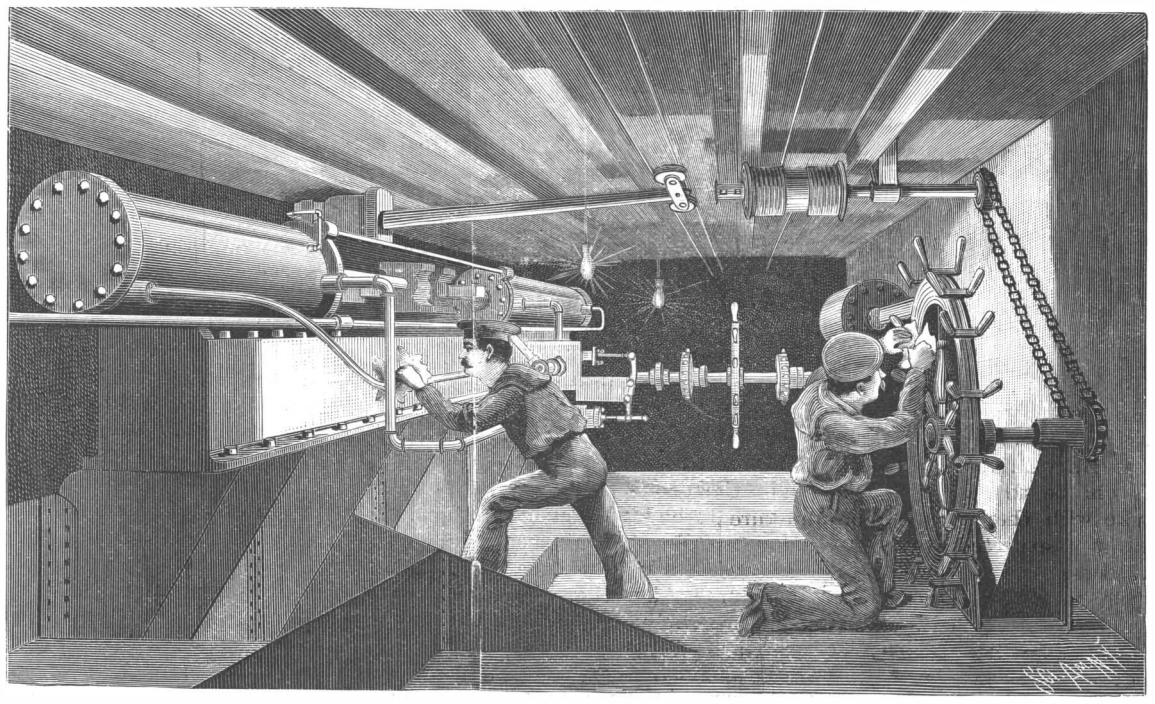

Fig. 4.—PNEUMATIC STEERING APPARATUS ON THE MONITOR TERROR.

Those of our readers who wish to learn the full particulars regarding this ship are referred to our issue of November 21, 1896, in which an illustrated description of a sister vessel, the Amphitrite, will be found. It may be briefly stated that the Terror is an iron, low freeboard, coast defense monitor of 3,990 tons displacement and 11 knots speed. Her armament consists of four 10 inch rifled guns, carried in two turrets plated with 11½ inches of steel, and a few light rapid fire guns. Her freeboard when fully loaded is only a little over two feet, and in a seaway the waves roll freely across her main deck. This renders her an extremely difficult mark to hit, and only at the closest quarters could she possibly be sunk by gun fire.

Our thanks are due to the inventor, Mr. A. A. Spiller, of Boston, for the data from which our engravings and description have been prepared.

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Cost of Track Sixty-five Years Ago.

In an old pamphlet which was discovered recently in the Astor Library, in New York, are some interesting figures with reference to the cost of a piece of track laid by the Baltimore and Ohio in 1830 and 1831. I. L. Sullivan, evidently a civil engineer, in a report to R. L. Colt, estimates that the track laid with wood sleepers, wood bearers, and plate rail, exclusive of ground and graduation, would cost $4,362 per mile; with stone blocks, wood bearers, and plate rail, of which the cost of iron was $1,324, the cost would be $5,115 per mile; with granite sills in line with plate rail, of which the iron was $2,037, the cost would be $6,500 per mile, divided as follows:

Sills at $11.50 per 100	$3,680
Bar iron	1,300
Broken stone	640
Various items	880

This engineer speculated on two ton loads and one ton cars, and said in his report that the Baltimore and Ohio would be doing a very rash thing if they went beyond this point. He also says, "The locomotive engine now operating successfully on the Baltimore road, made by Mr. Winans to run on a friction carriage, though of moderate power, has a great useful effect."

A FOUR SIDED DOVETAIL.

One who examines ornamental woodwork, such as is often seen in old English furniture, finds much to admire in the dexterity with which much of it is done.

Aside from its decorative interest, one may sometimes find in its construction clever little devices, often the invention of the skillful workman, and showing sometimes ingenuity that is very puzzling.

One is frequently surprised to find seemingly impossible things executed in the most simple way, and though these contrivances do not always give strength to the structure, yet are in themselves very interesting bits of decoration.

A most clever device of this sort is the four sided dovetail.

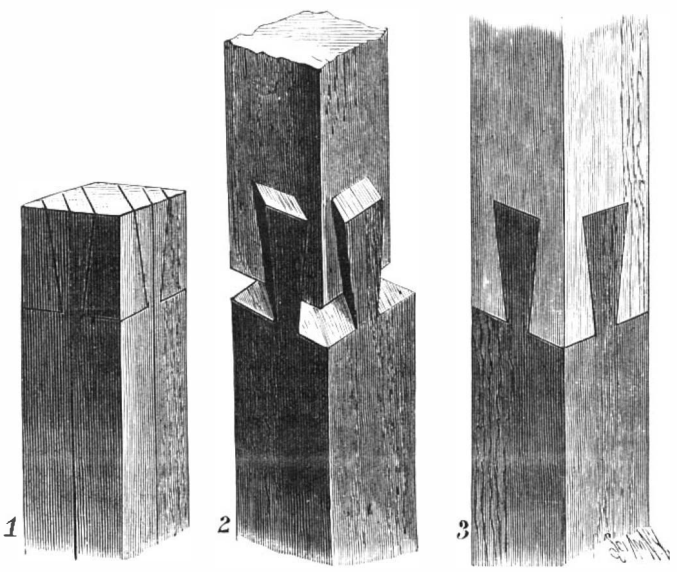
This is apparently two pieces of wood, usually of different colors, and four sided, dovetailed together end to end, thereby showing on each face a dovetail.

To a superficial observer, and probably to many who sought to discover the manner of so joining these pieces, it would prove a puzzle indeed, and almost impossible of accomplishment.

Like many of these peculiar devices in dovetailing, the effect and task is consummated by a very simple wedge problem. In this case the pieces are not pushed together end to end, but slipped into place from the side.

The cuts made in the one are so shaped as to receive exactly the parts of the other, and also so that when joined each side shows a dovetail.

In Fig. 1 we illustrate the method of laying out the work before sawing out the mortise. Fig. 2 shows the method of joining the two sections, and Fig. 3 shows the completed work.



A FOUR SIDED DOVETAIL.

An Anthropological Expedition.

Mr. Morris K. Jesup, president of the American Museum of Natural History in Central Park, has preparations well advanced for an exploring expedition which he proposes to send out in search of information in the line of anthropology and ethnology. The expedition will be the greatest, it is said, in point of time spent and territory traversed, ever backed by private individuals in this line of research.

America, Asia and Africa will be visited. Such specimens as are collected and such information as is gleaned on the subject of man in his earlier stages will be devoted by Mr. Jesup to the museum of which he is the head. This information, with some details, was given to a correspondent of the New York Times at Albany.

The expedition will be backed by Mr. Jesup from his private resources. Prof. F. W. Putnam, who was in charge of the anthropological division of the World's Fair and for many years a professor at Harvard, will conduct the expedition, and with him will be the anthropologist, Dr. Boas. They will take with them a competent corps of assistants, and will, it is expected, occupy six or seven years in their researches.

They will first visit the northwestern coast of America to the north of British Columbia, and will work up along the entire seaboard of Alaska. Then they will cross the Bering Sea to Asia, and work down the entire coast of Siberia and China, and around through the Indian Ocean to Egypt. Preparations for this long trip, with the incidental incursions to the countries visited, have been under way for some time. Among other things, the consent of the various Asiatic countries to visit them and make investigations of this nature has been secured, in part at least, and that of the others it is expected will be obtained without serious difficulty.

The expenses of the expedition are estimated at about $60,000.

Especial attention is to be given to acquiring information on the subject of man's first appearance on this continent, and all that can be learned on the subject of the earliest visitors from Asia, with their characteristics before they came and after their arrival, as well as the route by which they came, will be carefully collected.

Mr. Jesup, it is said, desires to make as complete a collection of anthropological antiquities as is possible, and proposes that time and money shall be devoted to the work with the same patience that characterized his efforts some years ago in collecting the specimens of American woods, which now form such a valuable exhibit in the museum. In making that collection more than ten years were spent. So confident is he that a collection worth having will be secured that he has consulted with the New York City authorities on the question of space for displaying it.

It is said the expedition will be started out as soon as the necessary arrangements can be made for so long a trip. The New York City authorities, it is said, are heartily in favor of locating such collections as may be made within the museum. Just how many assistants Prof. Putnam will take with him is not determined.

The Retirement of Prof. Newcomb.

Prof. Simon Newcomb, who retired from the navy and the superintendency of the Nautical Almanac on March 12, leaves a remarkable record of public service, through which he has become one of the foremost savants of the world. In the forty years which have elapsed since he first became connected with the Nautical Almanac office, and especially in the twenty years of his superintendency, he has done more than any other American since Franklin to make American learning respected and accepted in European countries. To-day every astronomer in the world uses Newcomb's determinations of the movements of the planets and the moon; every eclipse is computed according to Newcomb's tables; every nautical almanac is based on the determinations of the Washington office, and the shipping of the civilized world is guided either by the American Nautical Almanac or by ephemerides based on Newcomb's work.

Prof. Newcomb was born in Wallace, Nova Scotia, in 1835. He came to the United States in 1853 and began his career as a teacher in Maryland. He became acquainted with Joseph Henry, of the Smithsonian Institution, and Julius E. Hilgard, superintendent of the United States Geodetic Survey. The latter was so impressed with Mr. Newcomb's aptitude for mathematics that in 1857 he succeeded in getting the young man appointed a computer on the United States Nautical Almanac. Mr. Newcomb entered the Lawrence Scientific School and graduated in 1858, and afterward remained three years as a post-graduate student.

While in Cambridge he found time to plan and execute one of the most ambitious pieces of astronomical work undertaken up to that date. This was the computation of the orbits of the asteroids—that singular group of miniature planets revolving about the sun between Mars and Jupiter. Newcomb's first calculations were made on four of the asteroids in 1859, and attracted much attention when presented at the meeting of the American Association for the Advancement of Science at Springfield, where he exhibited a diagram showing the changes in the orbits during a period of many thousand years. In 1860 he published a general mathematical theory of the subject, applying it to a larger number of these little planets, and this publication at once gave to the young computer an international reputation.

In 1861 he was appointed professor of mathematics in the United States navy, and went to Washington to reside. Here he negotiated for the 26 inch equatorial instrument.

In 1870 he was sent to observe a total eclipse of the sun, visible on the Mediterranean, and established a station at Gibraltar. Unfortunately, the usual observations were prevented by clouds, but the opportunity was utilized in extending certain original studies concerning the minor motions of the moon. Lunar tables showing the recognized motions of the moon were already in existence, notably those constructed by Hansen and published by the British government in 1857; but even before 1870 it was found that the observed positions of the earth's satellite did not correspond with the computed positions, as shown by error in the calculation of the eclipses and in other ways; yet the problem defied the combined skill of the mathematicians and astronomers of the world. With his genius for tasks deemed insurmountable by others, Prof. Newcomb had already set himself to the resolution of the problem, and while abroad he visited the various observatories of Europe, and consulted the earliest records extant. The task was not abandoned until the problem of the motion of the moon was solved and until formulæ were developed for constructing accurate lunar tables. This triumph gained fresh laurels for the young astronomer throughout the world, and brought him official recognition from different nations.

Although the two tasks just noted were everywhere regarded by astronomers as of unprecedented magnitude, they were in reality only steps toward the accomplishment of a much greater task which Newcomb had already set for himself. This herculean labor was the accurate determination of the "elements of the solar system," including the measurement of the dimensions, weights and orbits of the principal planets, the larger asteroids and the more important statellites or planetary moons. This work was carried forward in connection with official duty as opportunity offered.

As early as 1867 he published a final memoir on the secular variations of the orbits of the asteroids; this was followed in 1874 by results of investigations concerning the orbit of the planet Uranus; the final researches into the motions of the moon were published in 1876, and other results of the work were placed before the public at frequent intervals in official reports as well as in unofficial scientific papers. In 1877 he was made superintendent of the Nautical Almanac office, and thus acquired additional facilities for carrying forward the laborious task, which he has now practically completed. The details of the work fill volumes, and are so complex and elaborate as hardly to be summarized.

As might be supposed, Prof. Newcomb's important labors brought him great honor. He is the author of several works on astronomy and other subjects.

The National Forests.

A law was passed a few years ago empowering the President of the United States to declare portions of the federal territory to be forest reserves. In this way many of our great national reservoirs, the sources of our rivers, were protected.

Over eighteen millions of acres of forests or river sources of land were declared reserved by President Harrison, and on Washington's Birthday, 1897, President Cleveland approved the report of the committee which has been studying the matter. By his action twenty-one millions of acres of forest reserves are preserved. The combined area of these two reserves is as great as the States of Maine, Massachusetts, New Hampshire, Vermont, and Rhode Island.

The location of the boundaries of these forest lands has been carefully studied by a commission appointed by the National Academy of Sciences, who have aimed to include as much as possible of the great bodies of timber and unclaimed land. Wherever it was possible to secure the continued existence of forests on high mountain slopes, they did not fail to do so. The committee was composed of Prof. Charles S. Sargent, who was president of the committee, Prof. Brewer, Prof. Agassiz, Gen. Abbott, Mr. Pinchot, and Dr. Hague.

The new reserves include all the central portion of the Black Hills of South Dakota, the Big Horn Mountain range in Wyoming, the basin of Jackson Lake, and the Teton Mountains south of the Yellowstone National Park in Wyoming, all the Rocky Mountains of northern Montana, an important forest in northern Idaho, the principal part of the Bitter Root Mountain region in Montana and Idaho, the Cascade Mountains of northern and southern Washington, the Olympic Mountain region in western Washington, the Sierra summits in California north of the Yosemite National Park, the San Jacinto Mountains in southern California, and the Uintah Mountains in northern Utah.

A CORPORATION to be known as the Southern California Power Company has been organized with a capital stock of $1,000,000. The purpose of the company is to develop power from the Santa Ana River by taking the water out at the junction of Bear Creek and Santa Ana River, carrying it in a cement ditch and tunnels about four miles, thus securing a fall of 1,000 to 1,100 feet, and then running the water again into the stream. The power will be transmitted by a pole line seventy-five miles to Los Angeles, there to be used to supplant steam power. It is said that it will be the longest line and the highest voltage (30,000 volts) in use in the world.

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INSECTS' WINGS—RAPIDITY OF VIBRATION IN FLIGHT.*

We should be decidedly remiss if in the study of this interesting insect we failed to investigate his means and powers of flight. His very occupation necessitates some rapid means of locomotion, and with this nature has abundantly endowed him. So great are their powers of flight that bees have been known to gather honey from buckwheat fields (a favorite pasturage) seven miles from their nearest possible habitation.

Not only are they capable of flying with great speed, but of carrying loads when on the wing which seem incredible.

Very often during the annual slaughter of the drones (the males, as before explained) have I seen a "worker" drag his victim, at least once and a half his own weight, from the hive, and after one or two efforts as if to secure and properly balance his load, sail lightly away and drop his burden only after going a long distance from the hive.

When we consider the difficulty of a person carrying a proportionate load, though sturdy of limb and with earth for a footing, we can realize the difficulty encountered by an insect with only the air for his support.

Nor is flight the only function of these useful members; they are equally indispensable in what might be termed the commonest drudgery of the household.

It must be borne in mind (notwithstanding the old rhyme) that bees do not make honey, they only gather it; and very rarely is it found in the nectaries of flowers in proper consistency to store for winter use. Falling dews and rains dilute it until, if stored in that condition in their warm hives, it would soon be vinegar, for which they have no use in their domestic economy.

Bees even gather, with great avidity, the maple sap from troughs in the "sugar bush," many gallons of which must be boiled into one to reduce it to keeping consistency. Their labors are therefore but half performed when the liquid has been collected; it must be "boiled down," so to speak, and the wings are the only means by which that toilsome process is performed.

Fig. 3.—WING STROKES OF BEE AS RECORDED ON SMOKED CYLINDER.

Visit the hives in the honey making season when you will, night or day, and you hear the incessant hum of their tireless wings.

As in the absence of blotting paper you sometimes blow upon the newly written page to promote evaporation, so by the vibrations of their wings the bees pass air currents over the honey to accomplish the same result. Never until honey is thus "ripened," to use the phrase of the beekeeper, will the cells be sealed or "capped" for winter use.

The wisdom manifested in inducing these air currents is often readily apparent. The entrance to a hive kept in my attic, for observation, consisted of a glass covered passage (between the hive and the window sill) about fifteen inches long by twelve wide and one-half inch high. During the honey making season the floor of this passage was often so obstructed with idle bees as to impede the passage of their more industrious fellows. When it was observed, however, that the wings of these "idlers" were always in motion, so rapidly in fact that each clung to the floor to prevent flight, and that all on one side faced one way while those opposite faced the other, thereby producing air currents in opposite directions through the same passage, and with the co-operation of those within, through the otherwise nearly air tight hive, I felt like apologizing to the toilers for my slanderous thought, and was impressed anew that "they also serve who only stand and wait." So rapidly does the evaporation progress that when a hive is placed on scales to note the daily increase, it is found to weigh materially less in the morning than on the previous night.

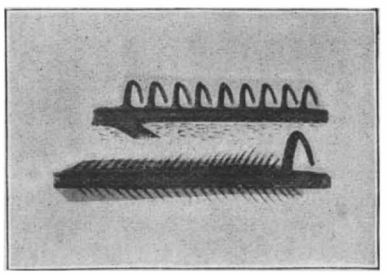

Fig. 1.—HOOKS FOR COUPLING THE WINGS OF THE BEE.

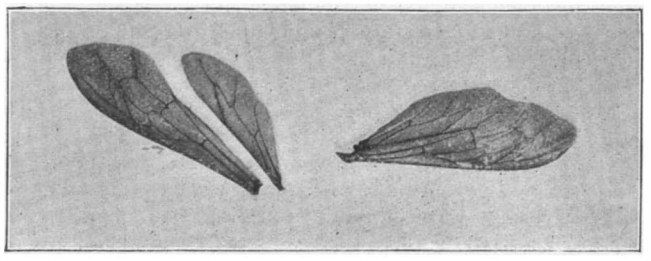

Fig. 2. WINGS OF THE BEE (ENLARGED).

The structure of the wing consists of a thin, transparent membrane stretched over a delicate framework of horn-like substance, essentially like those of the common fly, with which we are, alas! only too familiar. Unlike the fly, however, which belongs to the order Diptera, or two winged insects, the bee has four, a pair on each side. When closed they overlap upon the back, enabling the bee to enter flower cells unobstructed by his wings.

Unlike the butterfly and other four winged insects, the bee is provided with means by which the wings on either side may be coupled together, to secure unity of movement and greater efficiency in flight. The means provided is a row of twenty-one hooklets, a few of which are shown greatly enlarged in the accompanying cut.

These hooklets, attached to the anterior rib of the posterior wing, are so placed as to engage the hindmost rib of the forward wing, and thereby render the two one in effect, as seen upon the right in the next view; and yet quickly disengagable (as seen at the left) for overlapping when occasion requires (see cut No. 2).

In addition to this unity of action on either side there is also operative connection between the wings on opposite sides, though I am unable to state how it is effected. That it exists is proved by the fact that if the wings on either side be moved up and down, artificially, those on the opposite side will move in unison with them, though the bee may have long been dead.

The bee's wings are proportionately small in comparison to other insects'—some butterflies of the same weight having perhaps ten times the area of wing. The lack of wing surface is more than compensated for, however, in rapidity of vibration, otherwise such intensity and strength of flight would be impossible.

Having a bee tethered by a strand of fine sewing cotton around his waist (so to speak), that is between his thorax and his abdomen, I was struck with the strength of the little creature, as indicated by the strain upon the thread, whether afoot or on the wing.

With my little captive thus restrained, and contemplating the rapidity of wing movement necessary to produce such appreciable strain, I was impressed with a desire to know exactly the number of vibrations per minute, and following the impulse I am pleased to say I succeeded beyond the possibility of doubt.

While I realize that should I tell you I had counted them and that they sometimes exceed 15,000 per minute, and that I also have the certificate of the bee to the same effect, you would accuse me of treading, at least, on the borders of romance, yet I trust I shall be able to convince you that both assertions are practically true.

To effect this purpose I employed the running gears of a clock; and substituting a longer shaft for that which carries the minute hand, erected thereon a wooden disk surrounded with a two inch band of highly polished tin, thereby forming a short cylinder 18½ inches in circumference, which, controllable by a specially constructed governor, was revolvable at any speed within reasonable requirements.

When thus arranged, the cylinder was revolved slowly above a smoking lamp until so coated as to have the appearance of black velvet. It was found that this coating could not be thrown off by the highest speed obtainable, and yet that it adhered so lightly that a hair passed over it would leave its tracery upon the tin. With the cylinder rapidly revolving, a bee with his six legs held in light forceps, but with wings free and struggling to escape, was brought carefully near the revolving surface. At first contact the track was swept clean, leaving no evidence of the frequency of his strokes, and showing that increased velocity of the cylinder must be resorted to. After tiring out many bees, re-covering the cylinder many times, and finally increasing its speed to 120 revolutions per minute, I was rewarded with many wing-engraved records, one of which is shown in the accompanying cut (Fig. 3).

In this case the wing tracks seen upon the cylinder were precisely seven to the inch, which number, multiplied by 18½ (the number of inches in circumference),

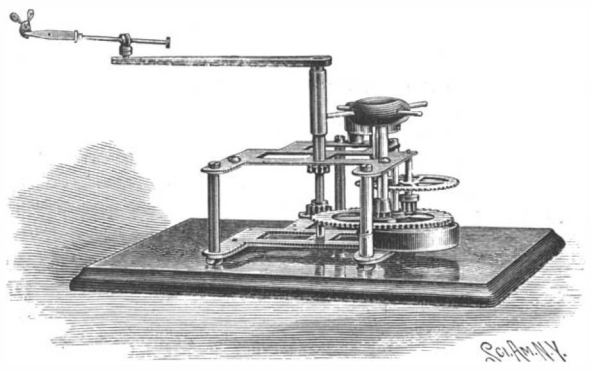

Fig. 4.—BEE MOUNTED ON REVOLVING LEVER.

and that by 120 (the number of revolutions per minute), gives the highest result inscribed upon the tablet on the cylinder, the results having been inscribed after the experiments were completed, the lowest number given being the record made by the bee, who, having become exhausted, was making but slight efforts to escape.

The certificate of the bee, to which I have referred, might be interpreted thus:

I hereby certify that when in flight I sometimes vibrate my wings at the rate of 15,540 strokes per minute. Signed (pointing to the wing tracks)

his
APIS *a* MELLIFICA.
mark.

While these results were entirely satisfactory and conclusive, yet, while pursuing the experiments, foreboding failure, I conceived yet another plan, which, from its very fascination, I was impelled to carry out, and which, though falling very slightly short of the highest record, yet virtually corroborated the results obtained by the former process.

Removing the cylinder, I substituted therefor a wooden lever or "hand," so to speak, which, with the apparatus standing upright, would revolve as the hand of a clock, and fitted the outer end to receive the stage forceps of the microscope.

When thus arranged, the legs of a lively bee were caught within these forceps, and thus pinioned, he was laid, back down, upon a surface covered with very tenacious glue and then another covered with thinnest gold foil cut into small squares, and there held until one of same adhered securely to his wing.

When thus caparisoned, the forceps were attached to the outer end of the lever and the bee was ready for his flight (see Fig. 4). This picture was taken, however, after the

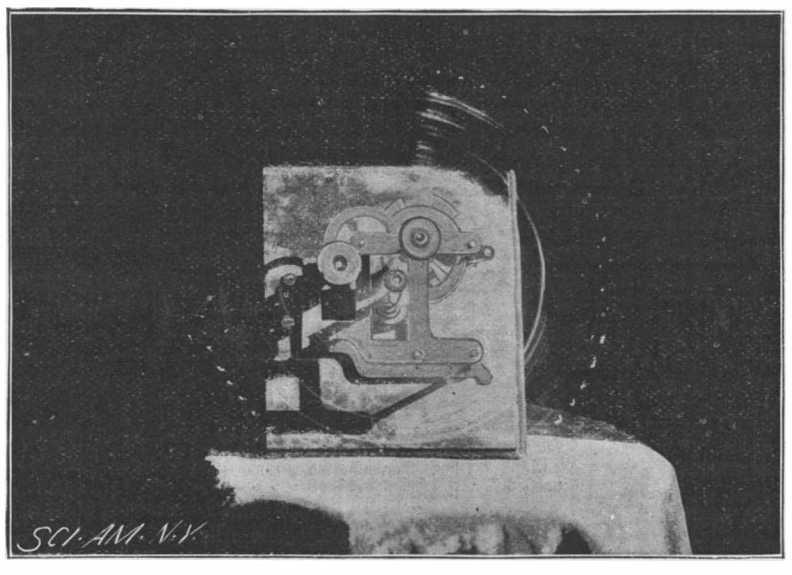

Fig. 5.—HORIZONTAL VIEW OF APPARATUS SHOWN IN Fig. 4, SHOWING SCINTILLATIONS OF THE WINGS.

*Extract from an illustrated lecture delivered by Aurelius Steward, of the Bridgeport, Conn., Scientific Society, at Cooper Union, New York, upon the subject of "The Honey Bee."

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bee had fulfilled his mission, and, thoroughly exhausted, had ceased struggling to escape; the object being merely to show the arrangement of the apparatus and the gold tipped wing of the insect.

The theory was that a bee thus equipped, if photographed in the bright sunlight while in motion, might throw flashes of light into the camera, which, on account of the advancing movement, falling in different places, might be counted upon the plate.

The "snap shot" of the camera was so arranged that the exposure would be only about three-quarters of one revolution, that there might arise no confusion by passing more than once over any part of the track.

I confess to many failures. Many tests were made and the pictures developed, only to discover that the bee had "left no sign."

At last, as a freshly captured subject made the circuit, his track was seen to scintillate, and on developing the picture the result was at once apparent, as plainly shown on the screen. (See Fig. 5.) At each vibration he had thrown into the camera a wingful of sunbeams. The insect and rapidly moving parts of the apparatus show only in dim, shadowy outline, but in his flight, with gold tipped wing dipped in sunshine, he has inscribed his record on the sensitive plate as unmistakably as if graven in stone.

Early Mediterranean Culture.

The address of Mr. Arthur J. Evans, president of the Anthropological Section of the British Association this year, is peculiarly rich in new facts and suggestions, says Prof. D. G. Brinton, in Science.

He returned but a few months since from his third archæological exploration of the island of Crete, and brings back with him ample evidence of the intimate contact of the natives of that island with the culture of Egypt probably as early as 2500 B. C.

No doubt the rays of this primitive insular civilization shone athwart the middle sea to the isles of Greece and the northern shores. But not on them alone did the wise of the race depend. Mr. Evans points out that the Mycenean culture of pre-Homeric days probably sprang from roots which we must seek in the soil of Anatolia, in that Ægean art which developed in the favored vales of Phrygia and Lydia.

Other questions, of broader scope, are also touched upon by Mr. Evans. Dismissing the "glamor of the Orient," rejecting the orthodox notion that the primitive Aryan was some sort of a "patriarchial missionary of Central Asian culture," he declares for the greater probability that what the Aryan knew he had learned by study on the spot, and that his lineage is to be traced in European or "Eurafrican" surroundings, from far back into the darkness of paleolithic times. Even then, in that rude and distant period, he was not of the brutes, brutish; for Mr. Evans relates an unpublished find of a surface burial, dating from Quaternary times, where the corpse had been laid in a position of decent repose, the shell knife, the deer's tooth ornaments, and the paint pot by its side.

The Recovered Classic.

The British Museum has once again the satisfaction of announcing the recovery of one of the lost classics—an announcement which will be welcomed by all but school boys, and need not, in point of fact, greatly disturb even their enjoyment of the Christmas holidays. Previous discoveries of the same kind have given us back authors from the later periods of Greek literature, Hyperides, Herodas, Aristotle. In the present instance it is one of the great lyric poets of the earlier days, Bacchylides, the nephew of Simonides, the contemporary and rival of Pindar, who is thus, in part at least, restored to us. The manuscript containing these precious relics of ancient literature is a papyrus recently discovered in Egypt. So far as the writing is concerned, it is in very good condition, being handsomely written in rather large uncial characters on papyrus of fine quality; but, unfortunately, the manuscript has suffered severely at the hands of its native discoverers, and is torn into many fragments. The date of the manuscript is probably in the first century before Christ. It will be the work of much time to bring the fragments into their proper order, and even when this is done, it is almost certain that much will be seen to have been lost; but, with due allowance for mutilation, it remains true that a substantial addition has been made to the extant treasures of Greek literature. Hitherto Bacchylides has been known only through the references of ancient writers and a handful of quotations, the longest being a graceful fragment of twelve lines in praise of peace. The lyric poetry of early Greece falls into two classes, which may be distinguished as personal and festal. Of the former, the main theme of which is love, with all the attendant joys and sorrows of the individual singer, the great representative is Sappho, with Alcæus and Anacreon in her train—all, alas! still waiting for the happy discovery which shall make them fully known to us. In the second class the great name for us is Pindar; but with him the ancients classed two other poets, Simonides and Bacchylides. All wrote the same kind of poetry, the common characteristic of which is that it celebrates some occasion of festivity or solemnity, such as hymns of triumph, dirges for the dead, chants to be accompanied by dances, and especially poems in celebration of victories won at the great games of Greece, the Olympian, Pythian, Isthmian, and Nemean festivals. It is of songs such as these alone that complete examples are extant, in the great odes of Pindar; and the newly recovered poems of Bacchylides belong to the same class of composition. It is too early as yet to say how many poems are contained in the new manuscript; but there would seem to be parts, at least, of some fifteen or twenty, varying in length from fourteen to about two hundred lines. The former might be held sufficient for some comparatively obscure victor, or for one who required a short chant for immediate use in prompt celebration of his success; the latter was needed when the patron was such a one as Hiero, the great ruler of Syracuse.—London Times.

Unreliable Popular Weather Proverbs.

Many persons still fail to realize the fact that the weather proverbs which pass down from generation to generation, as unquestioned as are the nursery stories, belong to what may be properly called mythology, says the Monthly Weather Review. Like the myths and legends of ancient times, they may, possibly, have had some slight basis of fact; they may possibly have applied satisfactorily to some far off period and some far distant land, or to one special occasion, but do not necessarily hold good to-day and in their own country. At a recent meeting of the Meteorological Society of France the members discussed the popular proverb: "When it rains on St. Medard's day it will rain for forty days unless fine weather returns on the day of St. Bernabe." M. Teisserenc de Bort showed that M. Lancaster, who several years ago examined this question, found no results tending to verify this saying. M. Teisserenc de Bort has also studied the question as to whether it was possible to predict in advance a rainy period; thus in examining the data collected from 1863 to 1896, he finds that in the first days of June the rain is, on the average, a little more abundant, and diminishes toward the end of that month. But it was not observed that there was any systematic grouping of the days of rain around the day of St. Medard.

M. Renou said that M. Elie de Beaumont has called attention to the fact that the proverb relative to St. Medard dates from the middle ages, and that since then the order of the saint's days in the calendar has been changed, and that now the day of St. Gervais is the one to which the proverb should be applied. M. De Beaumout, therefore, examined the question of the grouping of days of rain according to the new date, but did not find any verification of the proverb.

RECENTLY PATENTED INVENTIONS.

Mining, Etc.

TREATING ARSENIC ORES.—Gustaf M. Westman, New York City. This invention provides a process and apparatus for obtaining from the ores treated metallic arsenic, and separating and saving the precious metals they contain. The ores are melted by an electric current, one of the electrodes in the circuit being a stratum of lead beneath the ore with which the precious metals unite while molten, the arsenical vapors given off from the melted ore being condensed simultaneously with the precipitation and union of the precious metals with the lead. The construction is such that a number of charges may be treated in the furnace before removing its lead bottom containing the precious metals and substituting a new one.

ABSTRACTING PRECIOUS METALS FROM ORES.—John P. Schmitz, San Francisco, Cal. A box or casing in which are horizontal strainer plates is, according to this invention, filled nearly full of quicksilver, and the crushed ore, placer ground gravel or sand, is forced upward through the quicksilver by compressed air, the precious metals uniting with the quicksilver and the other ore or sand being blown away from its top, through a side opening in the hood covering the casing. Hot melted lead may be used instead of the quicksilver, the precious metals then uniting with the lead to form an alloy, which may be drawn off through a pipe at the bottom of the casing.

Agricultural.

THRASHING MACHINE ATTACHMENTS.—Asahel W. Eddy and Harvey P. Jones, Coleridge, Neb. A simple and economic device is provided by these inventors for the distribution of the straw and grain to the cylinder of a thrashing machine, and for cutting the bands of the bundles. The blades of the band cutter and feeder are of spiral construction, all the cutters standing at different inclinations, and when the material is piled up high on the conveyors the tendency is to separate the upper layers. The improvement is designed to facilitate the more rapid operation of the thrasher, the grain being distributed uniformly for presentation to the concave and cylinder.

FERTILIZERS FROM GARBAGE.—Lawrence Manuell, Newport, R. I., and Pliny Catucci, New York City. For the better disposal of garbage, etc., producing therefrom a useful filling for fertilization, these inventors have devised an apparatus having a pit from which leads a conveyer feeding to a disintegrator which empties into a second pit. An elevator, inclosed by a casing, rises from the second pit and extends to a digester which empties into a third pit communicating with a pump by which a filter is fed. The contents of the digester are boiled for a specified time and the gases are conveyed away, while the solid matter in the digested material retained in the pockets of the filter press may be used as a fertilizer.

EGG TESTER.—Henry F. Walton, Flandreau, South Dakota. This inventor has devised an egg examining apparatus comprising a box with transparent top, and in which are reflectors, a lamp holder being adjacent to openings in the box, and there being in the box sliding tables, a rack, etc. The eggs may be transferred from the receptacles in which they are packed to the testing tables, where one or more entire layers may be simultaneously tested, the bad eggs removed and replaced by good ones, and the tested layers then replaced in the case from which they had been taken, the entire work being done with a minimum of breakage.

Miscellaneous.

MOTOR VEHICLE.—Lewis Brown, Sawkill, N. Y. For use either as an ordinary road wagon or as a light passenger vehicle, this inventor has devised a motor carriage in which a motor of any preferred form is arranged under the rear part of the bed to be completely out of sight and out of the way. The gearing between the motor and the driving axle is very light and simple, and by a steering gear of novel construction the vehicle may be readily turned without excessive straining of the parts, the steering gear lever being within ready reach of the driver. An effective brake is provided, and the entire construction is designed to be simple and inexpensive.

BICYCLE TIRE.—Margaret A. Sancho, Brooklyn, N. Y. This tire is composed of a series of balls arranged continuously within a circular frame fitted in the grooved portion of the usual tire rim, the frame being segmental in cross section and having a removable section through which balls may be introduced should one or more of them become punctured and need to be replaced. The balls are held in place only by the curvature of the frame, whose side edges extend slightly beyond the center of the balls. A tire thus formed presents less surface friction than the ordinary tire, is designed to be especially advantageous in ascending steep grades, and is non-collapsible as a whole.

BICYCLE CRANK CONNECTION.—George Wilson, Madelia, Minn. A novel means of connecting the crank arm with the driving shaft, which has been designed by this inventor, possesses lightness, strength and durability, with great convenience of adjustment. The shaft has a substantially triangular stub end, and there is a corresponding hub on one end of the crank arm, there being grooves in the walls of the hub apertures to receive splines on the stub end of the shaft. The crank arm is locked on the stub end of the shaft by means of a wedge block and key bolt or by a set screw.

ACETYLENE GAS GENERATOR.—Guy S. Archer and Charles F. Burrington, Cherokee, Iowa This invention comprises an apparatus in which a holder with open lower end extends into a water tank, the holder carrying a suspended calcium carbide receptacle, and automatically rising and falling to generate gas in proportion as the latter is withdrawn from the receiver. The gas leaves the receiver in a comparatively dry state, from passing through an air space in the upper part of the holder, and is cooled by passing through a pipe which extends vertically through the water tank. The gas can be shut off for any length of time without danger.

FLOWER POT HOLDER.—Hosea Waterer, Philadelphia, Pa. This holder has an upper portion to receive the flower pot, and communicating with a base or reservoir adapted to hold any superfluous water draining off from the pot until it may be conveniently removed. In the lower, or reservoir portion, is a removable support of peculiar construction forming a rest on which the flower pot is held.

INKSTAND.—Charles S. King, Cross Fork, Pa. This inkstand has a rocking stopper crossing the ink well, and automatically closing the well after the pen has been withdrawn, the stopper being pivoted and moving when the point of the pen is applied to allow the pen to enter the ink.

TROUGH.—John S. and Joseph B. Weaver, New Oxford, Pa. The body of this trough is semicircular, of sheet metal, and into each end is fitted a head preferably made of cast metal, and held in place on the top by a band shrunk onto the exterior surface of the body and the top of the head, forming a water-tight joint. The topside edges of the trough are preferably protected by bent strips of sheet metal, thus strengthening the edges and removing the liability of stock being cut thereon.

VESSEL STEERING GEAR.—William Tuttle, Natchez, Miss. According to this invention the steering wheel, having the usual spokes, turns around an annular, ring-like support upon which is journaled a spindle provided with a drum adapted to carry the steering cable, and there is a rack and pinion connection between the spindle and the wheel. The improvement forms a simple and inexpensive connection between the wheel and the rudder, whereby the latter may be quickly and conveniently operated with a minimum of exertion, the proportions preferably being such that the drum will be given about eight revolutions for one revolution of the steering wheel.

LANDING NET.—Allan Holmes, Dunedin, New Zealand. In this improved device for the use of anglers the net-holding frame is adapted to be collapsed and folded along the handle for carrying and to be distended and locked in position for use, the change of form and position of the frame being produced by a swinging movement, and the locking and release of the locking devices being automatically effected by gravity. The frame is constructed of jointed segments pivoted to swing as a whole about a center pin fixed to a supporting and locking disk or head, in combination with pivoted pawls on the members and notches in the disk or head to receive them.

INHALER.—Hareey M. Dunlap, Battle Creek, Mich. An improvement in the cushioned surfaces or margins of inhaling cups or masks is provided by this inventor, the cushion consisting of an air tube provided with a vertically and transversely slotted attaching section to receive the marginal portion of the article to be cushioned. The cushion thus formed is elastic and pliable, and readily adapts itself to the face. It is easily removed for cleaning or disinfecting, or a number of persons, each having a separate cushion, may use the same instrument.

SURGEON'S SYRINGE.—Frederick Eissner, New York City. This is a syringe in which the several parts are arranged to be quickly and conveniently disconnected to permit of thorough cleaning and rendering the syringe aseptic. The barrel is preferably of glass, and the plunger is provided with a cylinder of rubber or other elastic material stretched over annular ridges on the reduced threaded end of the plunger stem, forming a very tight fit of the plunger in the barrel. The plunger stem passes through an elastic disk forming a stuffing box at the outer end of the barrel.

IRONING BOARD, BENCH AND LADDER.—William G. Rodgers and Charlie E. Kuhn, Johnstown, Pa. This is a combination device of simple and inexpensive character, which may be used as a bench to support tubs and other articles and as a stand for an ironing board and a rack for supporting clothes, the rack being so constructed that it may also be used as a ladder. The ironing board may be raised at one end to be inserted in a garment, and the device, when not in use, may be folded up and stowed away in small space.

KNIT FABRIC.—Thomas J. Woodcock, Philadelphia, Pa. To provide a fabric especially designed for the body portion of hammocks, but which may also be used wherever a strong knitted material is required, according to this invention, the warp threads are arranged in two sets, one in rear of the other, the threads being in serpentine lines, with the bights of the two sets turned in opposite directions and overlapping bights of adjacent threads of one set of warps being connected by one set of the knitting threads, and bights of adjacent threads of the other set of warps being connected by the other knitting threads. The material has but little tendency to ravel if punctured or torn.

INVALID BED.—James T. Hall, Monticello, Ark. This invention provides an improvement on a formerly patented invention of the same inventor. The frame or bedstead is preferably made of metal rods and has a central fixed section and upper and lower tilting sections, a lever being pivoted to the central section and links or rods connecting the lever to the tilting sections. A bath tub is designed to be fitted in position to give the patient a foot bath without removing him from the bed, and the upper bed section may be conveniently raised and held at any desired inclination.

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(7125) W. H. asks: Can hard rubber plates be used as well on a Wimshurst machine as glass? A. The trouble with hard rubber plates is their liability to warp. Otherwise they would answer admirably. 2. As a Wimshurst machine is more efficient, why do you always see Holtz machines advertised for X rays work? A. The Holtz machines seem more adapted for long sparks. The Wimshurst principle is usually employed on smaller machines.

(7126) C. writes: I wish to cement a glass cover to an iron cistern to contain mercury. Can you, through the columns of your valued journal, inform me how to prepare a cement adapted to this purpose which will likewise be vacuum tight and impervious to heat? A. Try silicate of soda. Your best plan is to attach it by a regular screw and flange attachment, packing it with asbestos board or some equivalent.

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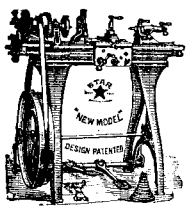

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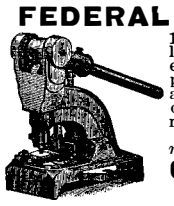

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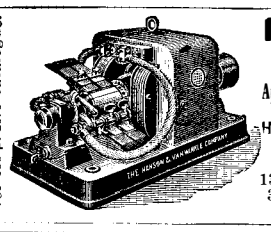

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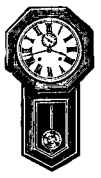

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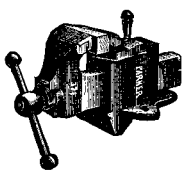

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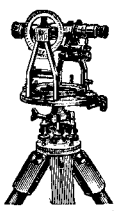

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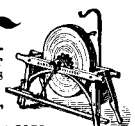

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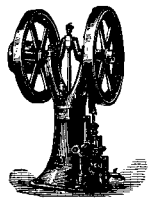

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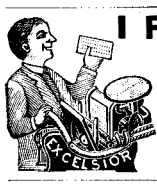

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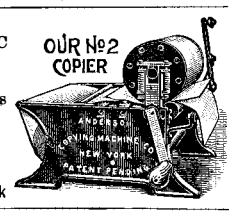

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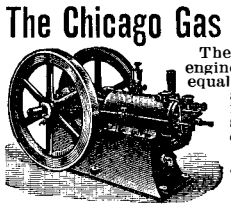

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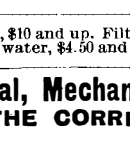

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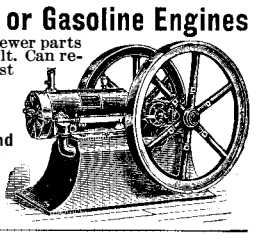

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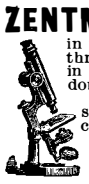
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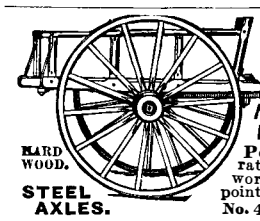
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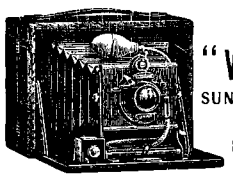
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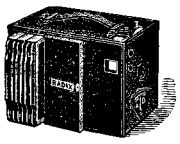
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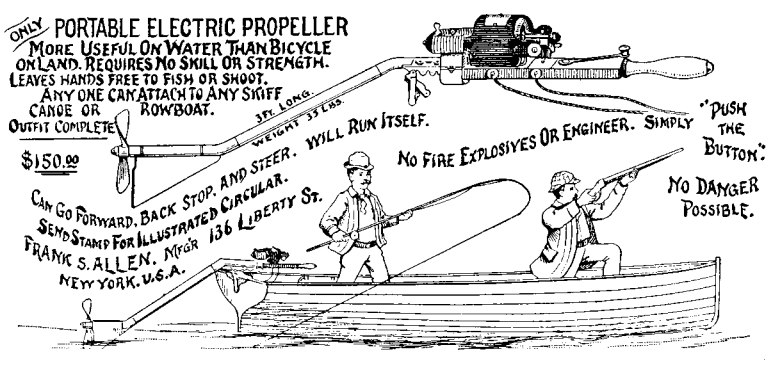
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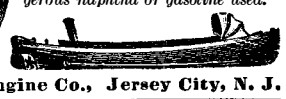
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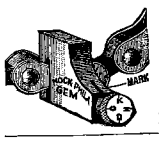
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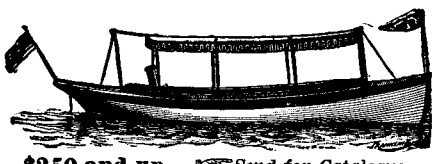
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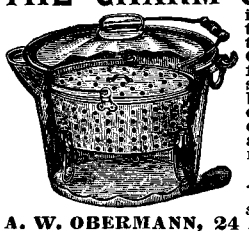
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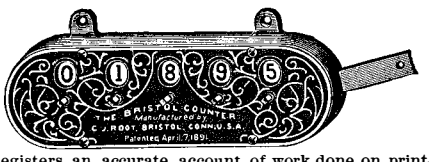

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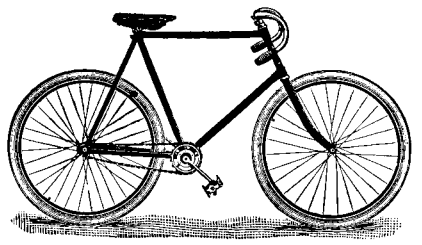
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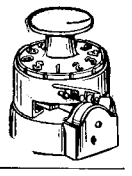

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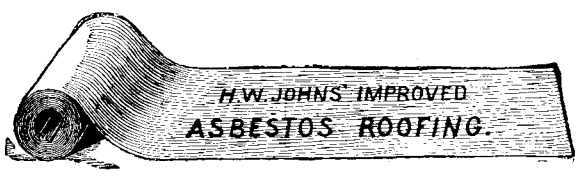

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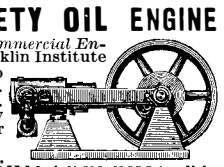

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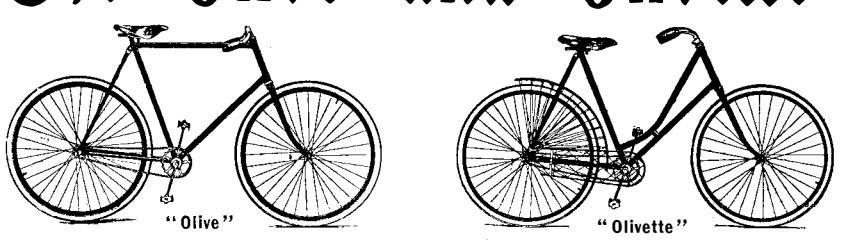

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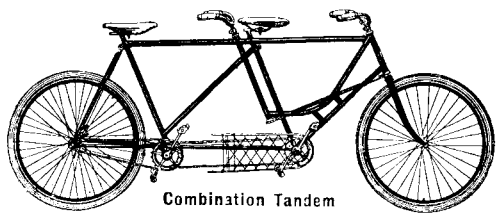

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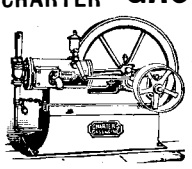

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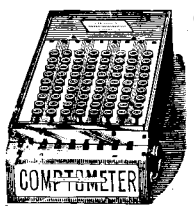

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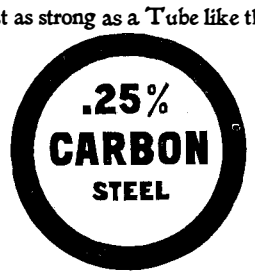

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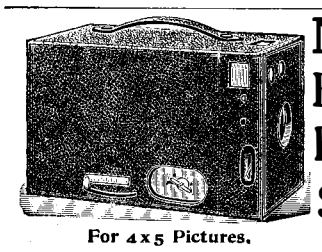

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